SCIENTIFIC AMERICAN

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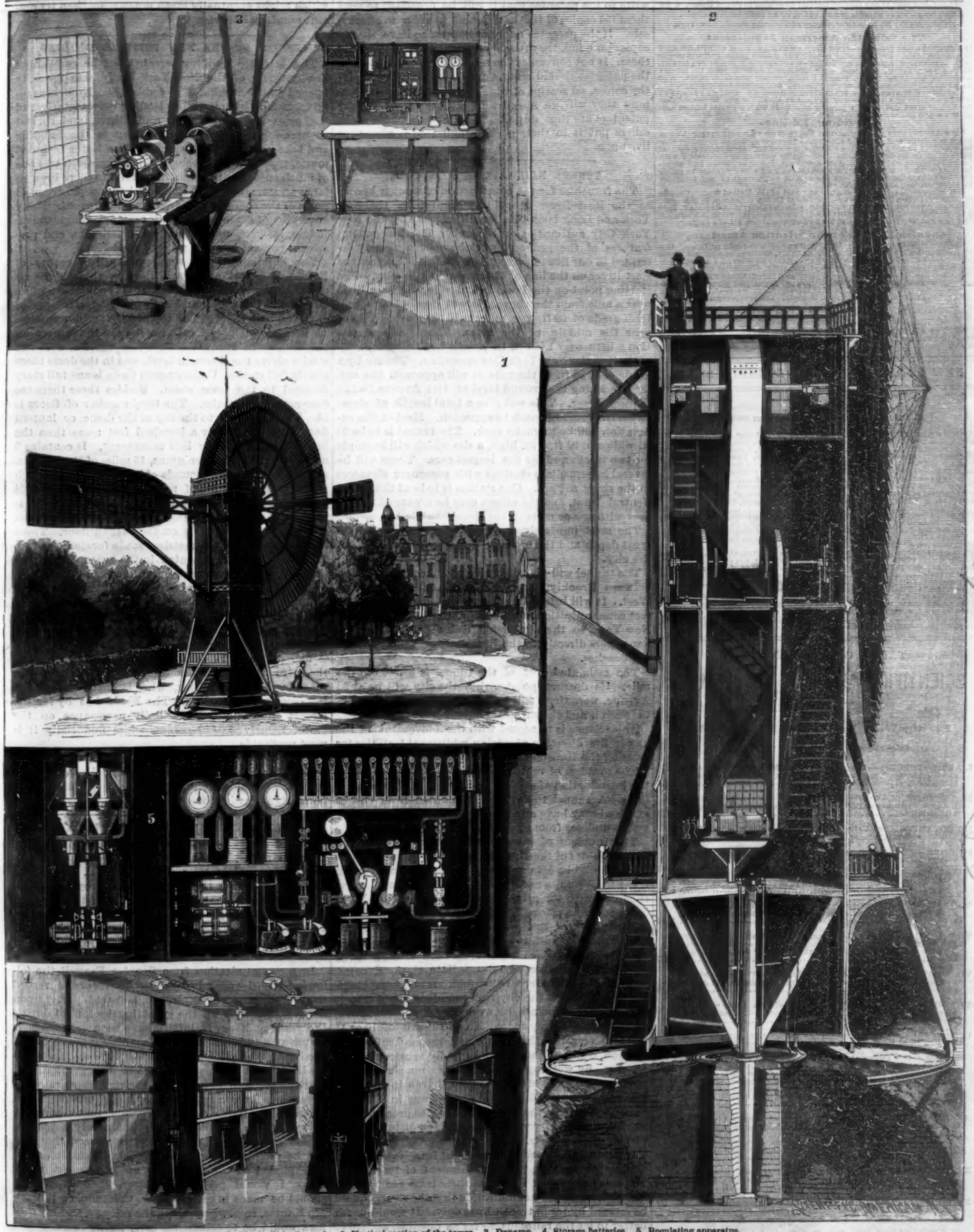

1. Windmill in the park. 2. Vertical section of the tower. 3. Dynamo. 4. Storage batteries. 5. Regulating apparatus.

THE WINDMILL DYNAMO AND ELECTRIC LIGHT PLANT OF MR. CHARLES F. BRUSH, CLEVELAND, O.—[See page 389.]

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NEW PATENT SELLING TRICK.

The latest trick of pretending patent sellers is to write to the patentee that it will be necessary to send them 180 copies of the new patent in order to effect a sale. If the patentee does not happen to have the 180 copies on hand, they (the sellers) will obligingly obtain them. If not convenient to send the full amount then, the patentee should remit say $9 in part payment for the copies, on receipt of which amount the sellers pretend they will go ahead and sell the patent. Many patentees are thus duped. They send the money, the sellers put it in their pockets, and that is what they live upon.

TUNNEL RAILWAYS IN NEW YORK.

The franchise for the construction of what is known as the East River tunnel was granted to the New York and Long Island Railroad Company by the New York City authorities on December 10. The general features of the proposed work have been already described in our SUPPLEMENT, No. 735. It is to cross the East River on the line of 42d Street in this city. The starting point on the Long Island side will be a little over a mile from the shore. It will descend at a uniform grade of 66 ft. per mile until it reaches a point near the middle of the river. There a level section a little over 1,000 ft. in length begins, which will carry it to the New York City shore line. Thence by a grade of 63·35 ft. to the mile it will approach the surface, reaching the ground level at 11th Avenue on the Hudson River. This will give a total length of about 20,500 ft. from approach to approach. Most of the excavation will be in gneiss rock. The tunnel is to be 26 ft. wide and 23 ft. 6 in. high, a size which will be ample for two tracks and for the largest cars. There will be several intermediate stations with passenger elevators to the street surface. One station is to be at the Grand Central depot, and the others may be arranged to connect with one or more of the elevated railroads.

The most impressive feature about the tunnel is its great depth and the crossing underground of the entire city.

The tunnel will give direct railroad communication between Brooklyn and the North, South, East, and West. It will bring the seashore of Long Island in direct communication with the interior of the State of New York, so that excursion trains can carry their passengers directly to the Rockaway or Coney Island sea beaches.

The estimated cost of the tunnel is $1,000,000 per mile. Its deepest point within the city will be at 2d Avenue, were there will be 118 feet, principally of rock, between it and the surface.

This scheme is in accord with the movement of the day in the direction of giving additional facilities for crossing the Hudson and East Rivers.

The problem of ventilation has been disposed of by the introduction of electric motors and of the electric light. A tunnel to-day may be lighted from end to end, and may have an atmosphere uncontaminated by smoke and gas from engines.

The problem of intercommunication between the opposite sides of the Hudson and East Rivers at New York should be attacked from the standpoint of rapid transit. A number of tunnels should be built, corresponding with the principal cross streets of New York. They could be of smaller size than the present North River tunnel, or this projected East River tunnel, as they would be built to accommodate smaller cars and motors. Each tunnel might cross both rivers and the city, with a number of intermediate stations, corresponding to the different thoroughfares running longitudinally. What the city really needs is rapid transit at a number of points between Brooklyn, New York, and the New Jersey shore. Small tunnels of 10 or 11 feet diameter, like the electric underground railway in London, could be cheaply and rapidly constructed. In London, by working on an average on six faces, as much as two miles of tunnel were driven in one year. It was demonstrated in London, as it was in this city twenty years ago, that such work can be prosecuted in the heart of the city without opening or disturbing the surface of the streets.

If new railroads are to be brought into New York by bridges or tunnels, the establishment of track yards becomes necessary. For these there is no room on the island. This is another indication that the rivers should be crossed by rapid transit lines only. It would be far better to let the railroads, as far as possible, adhere to their present terminal stations, on the shores surrounding New York.

In accord with the ideas of intercommunication between the present city and the adjacent shores is the proposed consolidation of New York and its environs. A board of commissioners is now in existence for investigating this plan, and already a report has been received from the president of the commission, Mr. Andrew H. Green. It is proposed to include New York, Brooklyn, and Staten Island and much adjoining territory in the new municipality. Whether the neighboring cities of the State of New Jersey can be absorbed or not remains to be seen, but the plan which would exclude the 200,000 inhabitants of the adjacent parts of the next State would seem incomplete. Mr. Green, in his report, advocated including Jersey City, which might eventually mean much more than its present municipal district.

OPENING OF THE NEW PULITZER BUILDING.

The Pulitzer building, erected as the publishing headquarters of the New York *World*, was formally opened on the evening of December 10. Numerous invitations had been issued to leading representatives of the press and government and others, and several thousand guests assembled to inspect the building and take part in the ceremonies. The latter included music, supper, and speeches, and the occasion was one of much enjoyment for all. Seldom has there been so large an assemblage of distinguished people from all parts of the country gathered under one roof. Many governors of States were there, senators, congressmen, judges, lawyers, authors, editors, merchants, and prominent persons in every walk of life.

The building, which stands upon the corner of Frankfort Street and Park Row, in this city, is remarkable for its great height. It is the highest office building in the world, and is the highest structure of any kind in the city. The top of Trinity Church steeple is barely on a level with the floor of the lantern on the dome. In the main structure there are 14 full stories above the sidewalk level, and in the dome there are six full stories. Underground there is one full story devoted to the press room. Besides these there are four mezzanine stories. The total number of floors is 26. From sidewalk to the top of the dome or lantern floor is 309 feet, nearly a hundred feet more than the height of the Bunker Hill monument. It contains 3 miles of wrought iron columns, 16 miles of steel beams, and about 5,000,000 pounds of iron and steel, enough metal to lay 29 miles of railway. There are 142,864 square feet, about 3½ acres, of floor space. There is brick enough in the building for 250 ordinary houses. The composing room is on the twelfth floor. There the type is set and the matrices made for stereotyping. The latter work is executed in the basement, so that the type never leaves the composing room floor.

The editorial offices are elegantly furnished, and the building contains every modern appliance for the tenants as well as for the publishers. It contains 79 rooms devoted to the publishing of the paper and 149 rooms for general office purposes. The success of the *World* is one of the marvels of the day, and is the result of the extraordinary abilities of its enterprising proprietor, Mr. Joseph Pulitzer, who is justly styled the Napoleon of journalism. The *World* has by far the largest circulation of any daily newspaper on the globe, namely, 300,000 copies, while financially it is most profitable.

The new building, contents, and land represent a cost of about two millions of dollars, and according to the official certificates published in the *World* there is no mortgage or indebtedness upon the property.

THE ARTIFICIAL PRODUCTION OF RAIN.

The question as to whether rain can be produced by artificial means is to be tested by the United States government. On motion of Senator C. B. Farwell, of Illinois, a clause was added to the Appropriation bill which provides that, under direction of the Forestry division of the Department of Agriculture, $2,000 shall be expended in experiments having for their object the artificial production of rainfall by the explosion of dynamite.

In a communication from Senator Farwell the following theories are advanced: "My theory in regard to producing rain by explosives is based partly upon the fact that after all the great battles fought during the century heavy rainfalls have occurred. This is historical and undisputed. Senator Stanford, one of the builders of the Central Pacific Railway, informed me lately that he was compelled to do a great deal of blasting through a part of the country where rain had never been known to fall in any useful quantities and where it has never rained since, and that during the period of the blasting, which was nearly a year, it rained every day. I feel almost convinced that rain can be produced in this way. The dynamite could be exploded on the ground or up in the air, and I think I would prefer the latter. The experiment should be made in eastern Iowa, Colorado, or in western Kansas, somewhere along the railway, and my own idea would be to commence early in the morning and explode continuously for seven or eight hours."

The subject of rain production by means of concussion

has been frequently discussed during the last twenty-five years. A great number of instances were stated by Francis Powers, C.E., in a volume entitled "War and the Weather, or the Artificial Production of Rain," 1871. Many cases are cited in which great battles have been followed by speedy rain. Six occurred during our war with Mexico in 1846 and 1847; nine cases of battles or skirmishes are given which occurred in 1861 in the war of the rebellion, and which were followed by rain at no great interval; forty cases are cited in 1862; thirty for 1863; twenty-eight for 1864, and six for 1865. Eighteen similar cases are also cited from among the great battles which have occurred in Europe during the past century, making a total of 137 cases. In a criticism of Mr. Powers' theory, *Silliman's Journal* said: "To this argument it may be replied that throughout the region from which his examples are mainly drawn, rain falls upon an average once in three days, and probably a little more frequently; so that from the conclusion of one rain to the commencement of another, the interval is on an average but little over two days. Now, battles are not usually commenced during a period of rain; generally not till some hours after the conclusion of a rain. Rain, therefore, ought to be expected in about one day after the conclusion of a battle. Now, the argument of Mr. Powers is lame in this point. He takes no precise account of the length of the interval between the conclusion of a battle and the commencement of rain; nor does he show that the interval is less than it should be if the battle had no influence in the production of the rain; and in particular he takes no account of the cases unfavorable to his theory, in which rain follows a battle only after a very long interval."

Some of the cases, however, which may be cited where the fall of rain seems to have been caused by the discharge of cannon are very striking. During the siege of Valenciennes by the allied armies in June, 1793, the weather, which had been remarkably hot and dry, became violently rainy after the cannonading commenced. Two hundred pieces of heavy artillery were employed in the attack and one hundred in the defense of the city, the whole of which were frequently in action at the same time.

At the battle of Dresden, August 27, 1813, the weather, which for some days had been serene and intensely hot, during the progress of the battle suddenly changed. Vast clouds filled the skies, and soon the surcharged moisture poured itself in a torrent of rain. At Waterloo, according to Siborne, the weather during the morning of June 17, 1815, had been oppressively hot. It was now a dead calm; not a leaf was stirring, and the atmosphere was close to an intolerable degree, while a dark, heavy, dense cloud impended over the combatants. The 18th Hussars were fully prepared and awaited the command to charge, when brigade guns on the right commenced firing for the purpose of breaking the order of the enemy's advance. The concussion seemed instantly to rebound through the still atmosphere and communicate like an electric spark with the heavily charged mass above. A violent thunder clap burst forth, which was immediately followed by a rain which has never probably been exceeded even in the tropics. In a few moments the ground became perfectly saturated.

Humboldt says that when a volcano bursts out in South America during a dry season it sometimes changes it into a rainy one. It is well known that in very hot calm weather the burning of woods, long grass, and other combustible materials produces rain. Very extensive fires in Nova Scotia are so generally followed by heavy floods of rain that there is ground for believing that the enormous pillars of smoke have some share in producing them.

Captain James Allen, acting signal officer of the War Department, in reply to interrogatories recently addressed to him regarding the probability of producing rain by artificial means, said: "One fact would seem to be easily admitted, that an attempt to explode gunpowder in order to practically demonstrate the advisability of attempts in rain production should at first be made after most careful consideration of the atmospheric conditions. For example, if these explosions should be made in the center of a high area, as shown by our weather maps, or even after a low area has passed any point, we may be absolutely certain no rain will follow. The first experiments should be undertaken to the southeast or east of a low area, and 300 to 600 miles from the center.

"Observing stations should be established every 5 or 10 miles for 200 miles to the eastward of the point of explosion. If the explosions are made in a comparatively clear sky, and after that unmistakable clouds are observed to the eastward and not to the westward, some connection may be surmised. It must be said, however, that even if the production of rain be practicable, it can only be for a very limited area, and it is believed that any benefit which can possibly arise from such rain can never amount to the expense of the enterprise."

The opinion of Captain Allen is similar to that of President H. C. Russell, of the Royal Society of New South Wales, contained in an anniversary address delivered in 1884. He says: "It would seem unreasonable to look for the economical production of rain under ordinary circumstances, and our only chance would be to take advantage of a time when the atmosphere is in the condition called unstable equilibrium, or when a cold current overlies a warm one. If under these conditions we could set the warm current moving upward, and once flowing into the cold one, a considerable quantity of rain might fall, but this favorable condition seldom exists in nature."

The experiment of producing rain by exploding dynamite is about to be tried, and the result will be awaited with much interest.

Daniel B. Fayerweather.

The bequest of $2,100,000 to twenty different colleges, and $95,000 to five hospitals, brings the name of Mr. Fayerweather, a New York leather merchant recently deceased, prominently before a public to which he was, while living, comparatively unknown. The largest beneficiary is Yale College, with $300,000, of which the Sheffield Scientific School receives $100,000, while Cornell and Columbia each receive $200,000. All the bequests, large as is their total, have been made with a wise discrimination, for the purpose of widening the scope and strengthening the forces of established institutions which aim to afford facilities for a liberal education to the largest possible number of those who will grasp it.

Mr. Fayerweather, without the advantage of much schooling when young, and with an environment which made it necessary for him from his earliest days to earn his own way in the world, was himself an example of one of the best educated of men, in the best sense of the term. His associates in the leather business described him in several speeches made at a meeting held at the time of his decease as being, above all things else, a model business man—thoroughly conversant with every detail, with an energy equaled by few, an uprightness and purity of personal character which no shadow could touch, and with a most winning presence. But there was this further about him—there was no useless lumber in his brain, no idle or purposeless efforts found occupation for his hands; and for an individual to attain a self-mastery which renders such description a truthful one is but to reach the end to which all thorough education is directed. He did not derive thoroughness of reasoning and close analysis from diligent study of the higher mathematics, nor were his powers of application strengthened and his mental forces trained by the discipline of the classics, but, with the broad intelligence which is almost a birthright of every American citizen, he united a mental equilibrium and integrity of purpose which, supported by tireless application, seemed to remove without effort every obstacle in the way of his success. He was always simple, direct, practical, and conscious of his own limitations; but, although he was extremely modest and diffident in manner, his view embraced a wider field than most of those who knew him were aware of. He was harnessed to hard work all his life, and, dying at the age of sixty-nine years, leaves the greater part of his accumulations to promote the cause of higher education in the world. It has been said that to know Shakespeare was a liberal education in itself. To know personally Daniel B. Fayerweather, as he was in business and in private life, was to be familiar with traits of character certain to insure success in any calling, without the help of fortuitous circumstances, and with a disposition ever open to opportunities to exercise a wise generosity. He was a high exemplar of American business men of the very best class.

The Argentine Cruiser 25 de Mayo.

The ship was built by Sir W. G. Armstrong, Mitchell & Co., and was designed by Mr. Philip Watts. She is 325 ft. long between the perpendiculars, 43 ft. broad, 16 ft. mean draught, and her load displacement is 3,200 tons. Her contract powers with natural and forced draught were 8,500 and 13,500 indicated horses respectively; and the contract speeds with natural and forced draught were 20¾ and 22 knots respectively. Her armament consists of:

Two 21 centimeter breechloading guns.
Eight 12 centimeter quick-firing guns.
Twelve 3 pounder quick-firing guns.
Twelve 1 pounder quick-firing guns.
Three 18 in. torpedo guns.

Her machinery, which lies wholly below the water line, and is further protected by a strong steel armor deck, has been constructed by Messrs. Humphrys, Tennant & Co. It consists of two sets of triple expansion four cylinder engines, working separate screws and supplied with steam from four double-ended boilers. In each set of engines there are two low pressure cylinders, each 66 in. in diameter, one intermediate pressure 60 in. in diameter, and one high pressure 38 in. in diameter; and the length of stroke is in each case 30 in. The armor deck extends the whole length of the vessel and is provided with sloping sides, as is usual in this class of vessel. Over these slopes the plating is 3½ in. and 4½ in. thick and the horizontal plates of the deck are 1½ in. thick. The armor deck is 1 ft. above the water line along its middle, and the principal hatchways are protected by 5 in. armor glacis plates and cofferdams. Immediately above the armor deck, also extending the whole length of the ship, is a raft body 3 ft. deep along the midship portion, and of greater depth toward the extremities where the armor deck inclines downward. Coal bunkers are constructed along the sides of the vessel above the armor deck, so as to form part of the raft body, and these and all the raft body spaces are very minutely subdivided by water-tight bulkheads. The normal supply of coal is 300 tons, but bunker capacity for 600 tons is provided.

At the recent steam trials, runs with and against the tide were made at various speeds on the Admiralty measured mile at the mouth of the Tyne, and a curve of performance in terms of revolutions of screws constructed. The official trials included a run of six hours' duration with natural draught, and the mean speed was determined by taking the total number of revolutions of the screws, obtaining therefrom the mean number of revolutions per minute, and applying these to the curve of performance previously obtained; the actual performance was 21·237 knots per hour. The mean power developed over the six hours was 8,700 indicated horses, and the mean number of revolutions 144·9 per minute.

We understand that the commission attached so very little importance to the forced draught performance of the ship that they would have accepted her without any official forced draught trial at all· but at the close of a long day's steaming, runs over th measured mile with and against the tide were made and the mean speed obtained was 22·43 knots per hou with 160 revolutions, and a mean indicated horse powe of 13,800. There can be no doubt that, if it had beer desired to do so, with fresh stokers and clean fires, a much better performance with forced draught might have been obtained.

The general features of the design of the 25 de Mayo are similar to those of the Piemonte, completed by the same firm about eighteen months ago for the Italian government, but the former vessel is about 700 tons heavier than the latter.—*Engineering.*

Washing Out the Stomach.

During the past year several physicians in New York have tried, with a gratifying success, a novel treatment for dyspepsia and cancer of the stomach by washing out that organ. The process is very simple and not dangerous. A long flexible pipe is passed down the throat until one end is in the stomach. The upper end has a funnel attached, into which hot water is poured until the stomach is filled. The weight of the water in the pipe and funnel gives a hydraulic pressure sufficient to distend the stomach. The pipe has an aperture big enough to hold a lead pencil. After the stomach has been filled, the funnel end of the pipe is turned down until it is lower than the bottom of the stomach, and the stomach is emptied as a barrel of any fluid is emptied through a siphon. The process may be repeated several times. The result is that the undigested food and mucus are washed out, and the hot water closes the blood vessels and reduces inflammation. The relief is immediate. The dyspeptic may have his stomach washed out before a meal, so that he can take a fresh start. After the lapse of a sufficient time for ordinary digestion, the stomach may be washed out again. This process has been in use at the New York Hospital, we are informed, for some time.

New Arms Wanted by the Government.

In his recent annual report to the Secretary of War, Gen. Benet, Chief of the Bureau of Ordnance, says: "The improvements in magazine mechanism have been rapid, and it seems peculiarly necessary, now that a change in caliber is contemplated, that our present Springfield single-loading system should be replaced, if it is possible, by an equally efficient magazine system. Accordingly, this office will recommend that a board be convened to select a suitable magazine mechanism, after a full and free competition among the best existing systems, as soon as the necessary preparations can be made. We have lost nothing by waiting until the present time. Several European nations during the past few years have made premature changes of caliber or have adopted crude repeating systems that have had to be abandoned for newer and better ones, often before the armies were fully armed with them."

Here is a fine field for the exercise of inventive genius.

Another Successful Inventor Gone.

The Rev. Robert Dick, the well known inventor of the newspaper mailing machine which is in use in most newspaper offices, died at the age of 74 in Buffalo, N. Y., on December 10. Mr. Dick made his first mailing machine in 1856, and he added improvement after improvement till the capacity of one of his machines will run up to 15,000 or 20,000 per day of labels like the subscriber's name on the wrappers of all the SCIENTIFIC AMERICAN publications sent through the mail.

AN IMPROVED NUT LOCK.

The device herewith illustrated, which has been patented by Mr. James M. Telfer, Minerva, Ohio, is designed to hold one or a series of nuts in place, and is adapted for use on all kinds of machinery, as well as

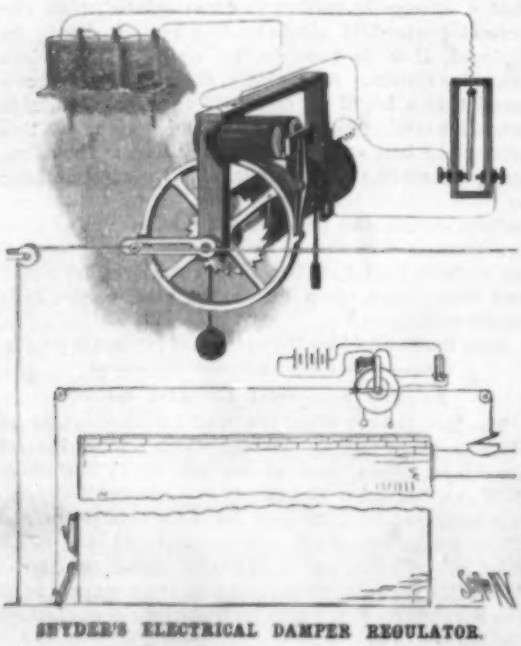
TELFER'S NUT LOCK.

for railway rail joints. Integral with a base bar on the upper surface of which is a longitudinal ridge are posts, each having on its upper end a slightly reduced eye, over which is passed a top bar resting on the top of the posts. Through the several eyes of the posts on the top of the top bar is passed a key having a head on one end, and provided at its other end with a ring, cross pin, or other device, to hold the key in place. On the under side of the top bar is a longitudinal ridge, and the ridges of the top bar and base are adapted to engage correspondingly shaped grooves on the sides off the nuts to be locked, the latter being first turned so that their bottom and top sides will be in line with one another. In the application of the device to the nut of a single bolt, a dummy bolt and nut may be employed.

BOOMER & BOSCHERT'S PRESSES.

The illustration represents a simple and compact yet extremely powerful hydraulic press, suitable for baling cloths, finishing ginghams, note and letter papers, and other uses. It is one of many kinds of presses made by the Boomer & Boschert Press Company, of Syracuse, N. Y., a firm which makes a wide variety of presses, both hand and power, for almost every use, including presses for wine and cider, lard, tallow and oil, vulcanized rubber and leather belting, etc. The knuckle joint press made by this firm has been in use over twenty years, and has attained a popularity that is unsurpassed, while their power screw press, more recently introduced, is almost as widely known. In their hydraulic presses they use a large sized ram in proportion to the amount of power to be obtained, and hence employ a much lower water pressure than usual, with a corresponding freedom from leakage and loss of time in stopping for repairs. They make hydraulic presses with from one to eight or more rams, according to the uses to which the presses are to be put. These

A COMPACT HYDRAULIC PRESS.



SNYDER'S ELECTRICAL DAMPER REGULATOR.

presses are manufactured under about forty patents owned or controlled by the firm, and covering nearly every detail of construction. Special tools have also been designed to insure uniformity of product.

AN AUTOMATIC ELECTRICAL DAMPER REGULATOR.

The illustration represents an apparatus, patented by Mr. John M. Snyder, of Hollidaysburg, Pa., for controlling dampers which regulate the draught of furnaces, the picture showing the application of the improvement for operating the check damper in the smoke pipe and regulating the air draught at the base of the furnace. On one end of a shaft journaled in a suitable frame is a ratchet wheel, and a scape wheel with two teeth, carrying a spring-pressed pawl to engage the ratchet wheel. On one end of the drum is wound a cord supporting a weight at its outer end, while on the other end of the drum a cord is wound in the opposite direction supporting at its free end a smaller weight, the unwinding of one cord winding the other cord. An electro-magnet is attached to the frame, and on a projecting arm is pivoted an armature-carrying lever, the lower end of which is adapted to engage the teeth of the scape wheel. A stop prevents the lever from touching the scape wheel itself, while a spiral spring holds it normally in position to engage one of the two teeth of the wheel. To one end of the shaft is attached a slotted crank, carrying an adjustable pin, a cord from which is extended to connect with the pipe damper and also with the draught opening of the furnace, both of which are operated simultaneously. Where the temperature is to be automatically regulated a thermostat is used, the compound bar of which extends between two electric contact screws, and upon the end of the shaft opposite that carrying the slotted crank is a grooved disk, two contact springs attached to the frame extending into the groove of the disk. On the disk, at a point ninety degrees from one of the teeth of the scape wheel, is a pin, and the contact springs are each connected with a different contact screw of the thermostat. One pole of the battery is connected with the fixed end of the thermostatic bar and the other pole with one terminal of the electro-magnet, the remaining terminal of the latter having a flexible connection with the pin in the grooved disk. When the thermostatic bar is expanded by heat to make contact with one of the contact screws, the circuit through the battery is closed upon the electro-magnet, thus operating the armature-carrying lever, so that the heavier weight revolves the drum, carrying around the scape wheel and crank, and operating the cord connected with the dampers, to close one and open the other. While this half revolution of the drum shaft is taking place, the circuit is broken between the contact spring and the pin in the disk, and the armature is released, so that the lever engages the next tooth of the scape wheel. A reduction of the temperature makes the circuit through another contact screw of the thermostat and the other contact spring extending into the grooved disk, when the armature lever is again drawn forward, allowing the other tooth on the scape wheel to pass, and the half revolution thus made again operates the dampers.

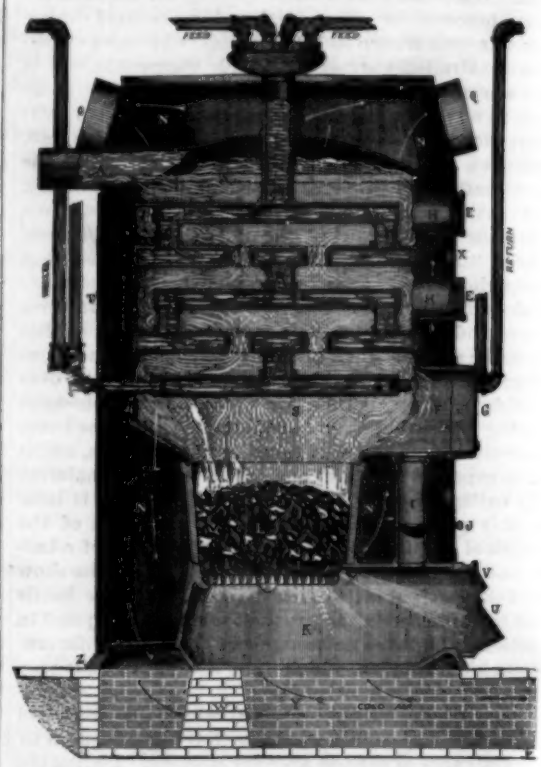
A HOT WATER VENTILATING HEATER.

The heater shown in the accompanying illustration is arranged to operate as a warm air furnace, supplying properly heated and moistened air to registers in the principal lower apartments of a house, as well as affording a continuous circulation of water for heating by direct hot water radiation in all the rooms. This combination insures a circulation of fresh warm air throughout a building, and, when proper air exits are provided, is designed to afford a perfect system of ventilation, by which the atmospheric condition of a house will be much superior to that of a building heated only by direct radiation.

The hot water chambers, C, C, are flat and round, made of heavy cast iron, and connected together by upright connections, D, D, screwed into shoulders on the chambers with lock nuts, over asbestos and lead-filled cup joints. These chambers are suspended inside the combustion chamber in such manner as not to impair the draught, while they are designed to sufficiently retard the exit of the products of combustion to extract practically all the heat therefrom. Each alternate section extends from side to side of the combustion chamber, and the products of combustion are forced to traverse over the entire top and bottom surface of each section until they pass into the exit flue, A.

The return pipe of the circulatory system enters the lower chamber on any side of the heater which may be most convenient, when the water circulation is necessarily positive and continuous, the water circulating upward as indicated by the arrows, through every portion of the interior of each chamber, before reaching the distributing feed pipe, and passing as many times over the fire as there are sections used. The warm air supply is produced by taking the air from the outside through the cold air duct, Y, at the bottom, whence it passes upward around the furnace, inside its double outer casing, to the distributing warm air pipes at the top, whence it passes, as shown by the arrows, to the registers in the principal apartments nearest to the heater.

This heater has the advantage of a thoroughly tested construction, being in its main elements of the same make as a heater manufactured by the same firm which has been in successful use for many years past, but which is here adapted to the combination system of direct and indirect heating.

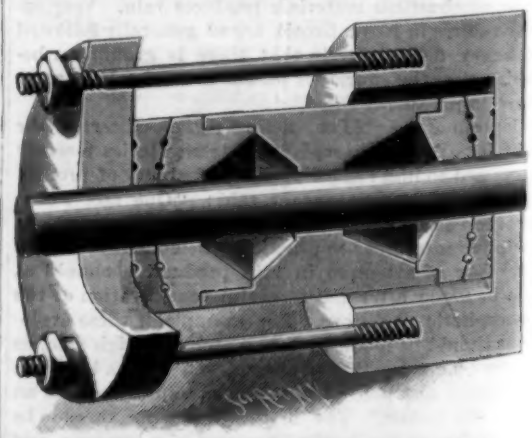


THE PEASE HOT WATER VENTILATING HEATER.

It is manufactured by the J. F. Pease Furnace Company, of Syracuse, N. Y., who will, on application, furnish descriptive pamphlets and prices to all interested.

AN ADJUSTABLE STUFFING BOX.

The construction shown in the illustration, styled by the inventor the engineer's stuffing box, is designed to reduce to a minimum the labor and attendance ordinarily required to insure perfect and constant lubrication, while decreasing or removing the liability to hot piston rods, etc. The central part of the stuffing box has conical cavities in its opposite ends, beyond which cavities extend cylindrical collars fitting glands having cavities on their inner faces, thus forming two inner spaces, one for fibrous and the other for metallic packing. The glands are convex on their outer side and fitted to concave plates, the outer faces of the glands and both faces of the concave plates having annular grooves for water or steam packing. This stuffing box is intended to be loosely inserted in the ordinary box, and held in place by an outer plate joined thereto by threaded studs, a spring being interposed between the nut on the end of each stud and the plate. This construction is designed to allow



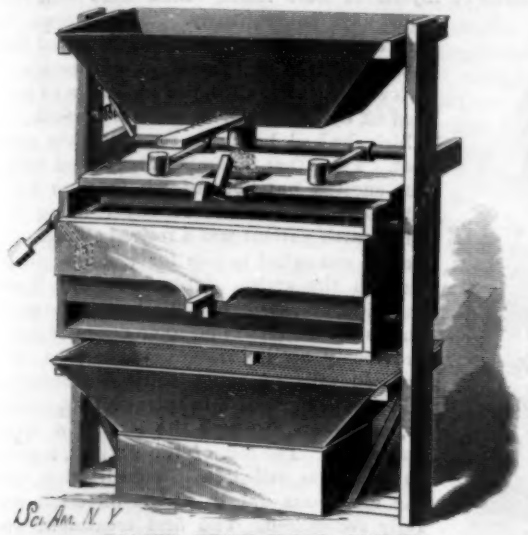
HITCHCOCK'S ADJUSTABLE STUFFING BOX.

for a slight lateral movement and still maintain a tight joint. Further particulars touching the invention may be obtained of the patentee, Mr. George H. Hitchcock, No. 101 Fairchild Street, Danville, Ill.

RENEW PROMPTLY.—We would call attention to the fact that the term of subscription of a large number of our readers expires with the next number of the SCIENTIFIC AMERICAN and SUPPLEMENT, and we wish to urge prompt renewals. This greatly facilitates the making up of our lists for the coming year and will secure the reception of the papers without interruption by the subscriber.

A MACHINE TO SAND BRICK MOULDS.

An easily operated machine, designed to thoroughly sand a number of brick moulds at a time, using the sand so that there can be but little waste, is shown in the illustration, and has been patented by Mr. Robert P Roach, of Atwood, Tenn. Mounted centrally on trunnions between two standards is a revoluble box having pockets on its four sides to receive the brick moulds, the box having an opening through one of its sides through which the sand is introduced. The moulds are of the usual construction, divided by par-



ROACH'S BRICK MOULD SANDER.

titions to hold a number of bricks each, and they are held in position in the pockets by angular catches pivoted in recesses at the center of the sides. A hopper in the upper portion of the frame supplies the sand through a depending spout in alignment with the opening in one side of the central box, the supply being controlled by a laterally sliding gate in the bottom of the hopper, and a box below, covered by a suitable screen, receives the sand which drops when the moulds are removed, so that it may be again used. Upon arms which extend laterally from the standards, above the revoluble box, is pivoted a shaft on which are projecting rods, carrying mallets, which are held normally on the top of the box by the tension of a spring which connects an arm on one end of the shaft with the main frame. The latter arm has a series of notches by which the point of engagement of the spring therewith may be changed, to increase or diminish the tension, and thus regulate the force of the blow struck by the mallets, according as the moulds are more or less wet when being sanded. An arm extending downwardly from the opposite end of the shaft is adapted to engage pins on the outer end of the box, so that when the latter is revolved the pins will successively strike this arm, tilting the shaft and causing the mallets to strike upon the sand box, to jar superfluous sand from the moulds. Projecting from one of the standards is a stud on which is pivoted a bell crank, one member of which is caused to press against the end of the sand box, and engage recesses therein, by a weight on the other member, thus preventing the sand box from turning backward. The moulds when inserted close the pockets, and the inside of the moulds being open to the interior of the box, which has been supplied with sufficient sand from the hopper, the revolving of the box causes the moulds to be thoroughly sanded.

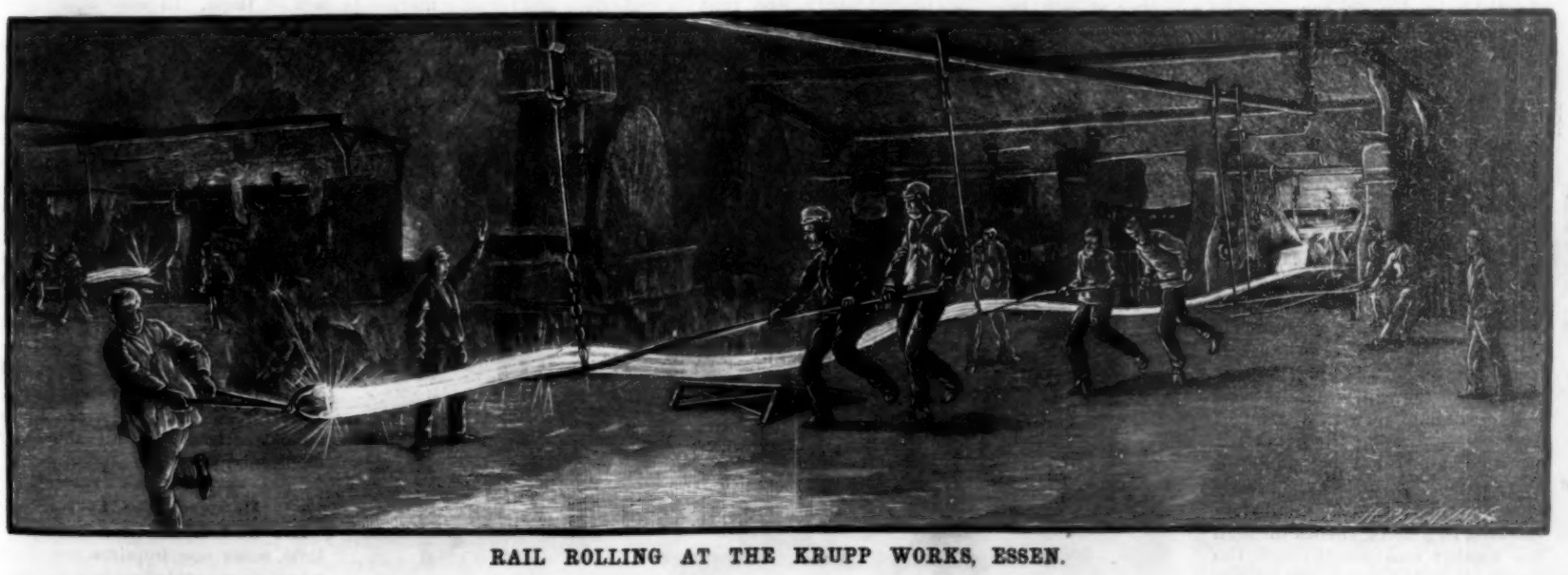
A NATURAL gas well at Normal, Texas, although only 60 feet deep, yields a fine flow of gas and produces a flame 5 feet high.

Danger of Advertising Houses to Let.

The case of Noble *v.* Yates, tried by Mr. Justice Charles and a jury recently, should be noticed by house owners and intending tenants. It was an action against a house owner by a would-be tenant for damages sustained through being injured when looking over a house which it was proposed to take. The jury found a verdict for the defendant. There seems, however, to be no doubt that if a person goes into a house which is to be let, and falls, as the phrase is, into "a trap," that the owner of the house would be liable for damages, as, for instance, if a piece of an apparently sound flooring were to give way. On the other hand, people who go over houses must be careful. If they have been guilty of contributory negligence, they cannot, of course, recover damages. The moral seems to be that each party must be careful, but in some respects the chief care should be that of the landlord, who must have no missing steps and similar "traps," which are so conducive to accidents.—*The Builder.*

RAIL ROLLING AT THE KRUPP WORKS, ESSEN.

The name of Krupp is familiar to all far beyond the boundaries of Germany, or even of Europe, and therefore we feel sure that any reference to his works, or the appliances used therein, will be of interest to our readers. The accompanying engraving, for which we are indebted to the *Illustrirte Zeitung*, shows the process of rolling railroad rails as practiced in this establishment. Most of the Bessemer steel made here is used in the manufacture of railroad rails. It is cast in blocks which contain sufficient material for two or three rails, according to the desired weight of the rails. These blocks, while they are still red hot, are carried to the preparatory rolling mills by horses which have been trained to work in the midst of this fire and noise. Here they are heated, or rather kept hot, in special furnaces and are rolled into longer blocks having a square cross section. After being thus prepared they are taken to the rail rolling mills. These consist of two complete rolling mills with all the appurtenances, which stand near together in one large room. The blocks which come from the preparatory mills are heated again and then passed between the rollers, of which there are three placed one above the other, so that the rails are rolled during the backward as well as the forward motion without requiring a change in the direction of rotation of the rollers. The rails have to pass back and forth between the rollers thirteen or fourteen times, and each time that they come from the rollers they are caught by the workmen on the short, bent ends of long levers which run on rollers on movable carriers. Each time the rail passes from between the rollers it is longer and its cross section narrower than after the former rolling, until it finally stretches itself out like a gigantic fiery snake. It is then taken to a circular saw which cuts through the glowing metal as easily as a wood saw in a carpenter's shop cuts through a piece of wood, dividing the long bar into two or three rails. The cold rail is now put under presses by means of which skillful workmen remove even the slightest irregularities. The final operations consist of boring the holes, evening the end surfaces, etc.



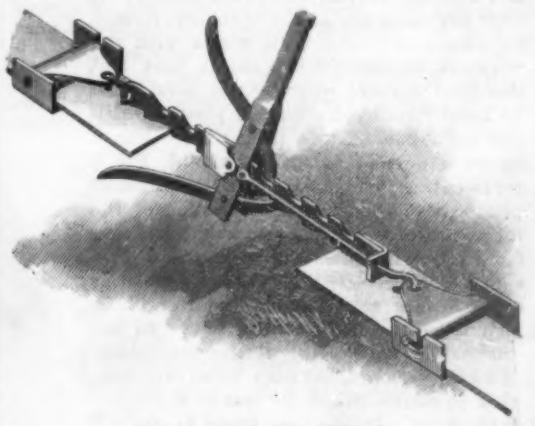
RAIL ROLLING AT THE KRUPP WORKS, ESSEN.

Lecture on the Mammoth Cave.

A highly interesting lecture on the Mammoth Cave, Ky., was delivered in Chickering Hall, New York City, before the American Geographical Society, on the 8th inst., by Dr. H. C. Hovey, of Bridgeport, Conn. The lecture was illustrated with elegant lantern views. The house was crowded by an audience representative of the intellectual *elite* of New York. The general verdict pronounced it one of the most fascinating and instructive lectures ever given before the society. As a popular lecturer, Dr. Hovey has few equals.

AN EASILY OPERATED BELT TIGHTENER.

The device shown in the engraving, for which a patent has been issued to Mr. William King, affords a ready means for tightening belts, and holding them in taut condition until the ends are joined. The frame of the clamp is a plate bent upward at the ends forming flanges between which the belt is passed, and one of these flanges has a circular aperture and the other an L-shaped slot to receive a removable dog, the latter having pintles and a depending toe designed to readily catch fast to the belt. A rack bar, with the teeth arranged alternately on opposite edges, has at one end a guide block through which slides a draught bar having at its outer end a hook adapted for connection with one of the locking dogs, while the other end



KING'S BELT TIGHTENER.

of the draught bar is pivoted to a forked lever between the limbs of which are pivoted two latch bars whose toes are adapted to engage the teeth of the rack bar when the lever is rocked. The opposite end of the rack bar is connected by a link with the locking dog of the other clamp, while upon the forks of the operating lever is pivoted an abutment block, through which the rack bar loosely slides, adapted to enforce engagement of the latch bars when the lever is vibrated. When the parts are connected with the belt, as shown, and the lever is slowly vibrated, the latch bars alternately push against the teeth of the rack bar, and pull the locking dogs, each engaging a section of belt, toward each other.

For further information touching this invention, address the patentee, or Mr. J. W. Denio, Longmont, Col.

American Society of Mechanical Engineers.

The convention of the American Society of Mechanical Engineers met at Richmond, Va., November 12. The following officers were elected for the ensuing term: President, Robert W. Hunt, of Chicago; vice-presidents, Stephen W. Baldwin, of New York; John F. Parkhurst, Cleveland, Ohio; Alexander Gordon Hamilton, Ohio; managers, Andrew Fletcher, New York; W. R. Warner, Cleveland, Ohio; Coleman Sellers, Jr., Philadelphia. The secretary read the report of the committee from the American Society of Mechanical Engineers which attended the joint meeting. A resolution was passed for the establishment of headquarters at Chicago, and also the holding of an international congress of engineers, during the exposition, to be in session six days, the proceedings to be conducted in English.

IMPROVED FURNITURE POLISH.—The composition is as follows: "Beer, waste beer, cold tea, or vinegar, 48 parts;" methylated spirit or finish, 32 parts; dragon's blood, 1 part; gum benzoin, 3 parts; linseed oil, 16 parts.

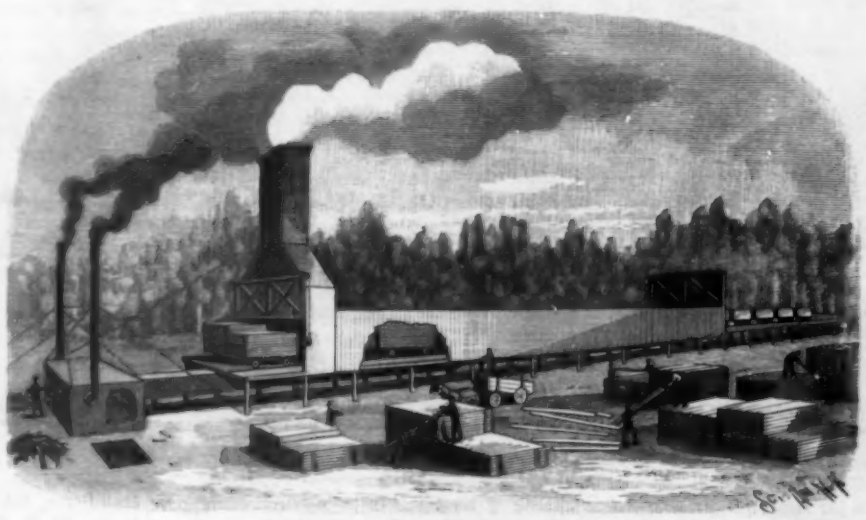
AN IMPROVED ARTICLE FOR PLASTERING, TILING, AND CEMENT WORK.

The illustration represents a novel description of moulds and plaster slabs, and method of making the slabs, to be attached to the interior or exterior walls of buildings and their ceilings, for the reception of brown and finishing coats. This slab is primarily designed as a foundation for plastering, in which respect it is designed to be superior to all other materials, taking the place of the ordinary wood lathing and the various forms of metal lathing, while it is also adapted as a foundation for cement work, and for making a permanent and effective fireproof floor on top of boarded floors. The making of these slabs forms the subjects of two patents, issued to Mr. Thomas Curran. The moulds in which they are made are of heavy rubber, formed by means of suitable die plates with the requisite undercut longitudinal bars and marginal borders, whereby the mould can be readily removed after the plaster which has been poured into it has set. Fig. 2 shows a portion of such a mould, Fig. 1 representing its removal from the hardened plaster, and Fig. 3 shows a section of the formed slab, which is preferably made four feet long, sixteen inches wide, and five-eighths of an inch thick, the dovetail ribs on its surface rising about a quarter of an inch from the body of the slab. In the composition of the slabs, plaster, lime, alum, and fiber are used, the fiber being saturated with pyrodine liquid to render it fire and water proof. It has been found in practice that cocoanut fiber is a strong and excellent material for the purpose, while being also comparatively inexpensive. The slabs thus made have sufficient elasticity to permit of some bending, while they afford a good hold for the large-headed galvanized nails which are preferably used in fixing the slabs in position on the studding or beams of walls and ceilings. These slabs afford especial facilities for obtaining fine cut stone effects with Portland cement on the exterior of frame houses, and they can be used as a foundation for tiling on walls, ceilings, and on top of boarded floors. The moulds are also adapted for producing dovetail grooves on all kinds of plaster blocks. They have been thoroughly tested by the inventor, who is a practical builder, and to whom application for further information may be made, at No. 135 Broadway, New York City.

CURRAN'S GROOVED PLASTER SLAB.

AN IMPROVED LUMBER DRIER.

The illustration represents a simple and durable construction, which forms the subject of a patent issued to Mr. La Fayette C. Van Duzer, adapted to facilitate the drying of lumber by means of the heat and gases of a furnace, or by hot air only generated by the furnace. The ash pit of the furnace is preferably located underground, and connected with a side entrance, and the fire box is surrounded by a heating chamber adapted to be directly connected by a damper at each side with the interior of the fire box. Flues, each having a damper, lead from the fire box to a transversely arranged flue within the heating chamber, the latter flue extending to the outside in both directions, and having upwardly turned ends, to carry off the smoke and gases. A channel from the heating chamber extends under the front end of the floor of the drying kiln, and the rear end of this channel connects with a second channel covered by metallic plates forming the kiln floor, the plates being supported on posts which also support rails for the cars carrying lumber to be dried. There is a vertically sliding door at each end of the kiln, and at its front end is a chimney with a damper. The plates forming the top of the second channel have openings in their rear ends, so that the hot air passes to the rear of the kiln before entering it, passing thence through the lumber and out through the chimney at the front end of the kiln. Below the chimney, in the floor of the kiln, is a transverse opening, communicating with flues in the chimney and controlled by a damper, so that by opening the latter damper and closing the regular chimney damper a lower draught is obtained and the hot air is made to circulate more thoroughly around the lower portions of the drying chamber. The furnace is adapted to burn waste lumber products, such as slabs, sawdust, shavings, etc. The cars loaded with lumber are first moved into the front end of the kiln, where they are exposed to a low temperature, and are thence moved gradually to the rear end of the kiln, into a higher temperature, whereby the lumber will be evenly dried without warping, when the cars are passed out through the rear door. For further particulars relating to this invention address the Clay Lumber Drier, room No. 418, Odd Fellows' Hall, St. Louis, Mo.



THE 'CLAY" LUMBER DRIER.

The Curability of Cancerous Tumors by Interstitial Injections of Bichloride of Mercury.

According to the Paris correspondent of the *Medical Press and Circular* for September 17, 1890, Professor Poucel, surgeon to the Marseilles Hospital, suggested, in 1884, that, in order to explain the production of cancer, it would be found at no distant date that the microbe of cancer would be discovered by the microscope. Since then efforts were made to prove the parasitic origin of the disease, and some pretended to have discovered the new microbe, but soon afterward the pathogenic value of the bacilli, and it was even said that the micro-organism was not necessary to explain the clinical phenomena of cancer. Assuredly the transport of living cancerous cells by the veins, and above all by the lymphatics, would produce homologous tumors wherever those cells could find favorable conditions for germination. This mechanism, although explaining the generalization of the tumor, does not clear up its cause. The bacilli of cancer, as in the case of tubercles, exacts certain conditions which are transmissible in an hereditary sense, and which constitute the predisposition and the tendency. When these exist, the rapid growth of these micro-organisms becomes possible, and through their contact the epitheliums become inflamed, proliferous, and deformed, characterizing cancer. It was with this idea that he undertook a series of researches at the hospital of Marseilles. He had shortly before obtained a prompt cure of a malign pustule of a very bad form by injections of corrosive sublimate around its base, and these injections proved to him, first, that the bichloride had no ill effect on the tissues; and, secondly, that it was efficacious against microbes absorbed through the lymphatics. It appeared to him, then, that it was quite rational to apply this treatment to cancer, or at least to tumors of a cancerous aspect of which the microbe (if there be one) is transmitted by the same means. Seven patients have already been submitted to this treatment, of whom the details are here given. The first was a woman without any syphilitic antecedents, whom he had treated for a long time with iodide of potassium. In the month of February last she entered the hospital for an ulcerated cancer of the right breast, which commenced ten months previously. The tumor was hard, uneven, and occupied all the mammary glands; the nipple was retracted, and the ulceration occupied the under part, giving exit to a fetid and abundant discharge. The axillary glands were as yet untouched, the tumor was free, and the general condition of the patient good. On the same day of her entry six injections (the half of an ordinary subcutaneous syringe each time) of a solution of bichloride of mercury (1 in 1,000) were made into the most indurated points. No salivation followed, but the breast became a little inflamed. A month subsequently the woman returned, when it was found that the tumor had diminished in volume, and another series of injections were made, which were renewed four days subsequently. The decrease of the tumor was much more marked, and the fetid discharge had ceased. Unfortunately, a few days afterward, the patient was carried off by an attack of angina pectoris, to which she had been for several years subject. Two other patients were treated without success, but both of whom were very advanced in age, one of them being 81. The fourth patient was a retired officer. M. Poucel was called to him for a large phlegmon in the groin. After incision, a hard ganglion, of the size of a nut, was discovered, and as the man had had some dozen of years previously an indurated chancre, he was ordered pills of proto-iodide of mercury. The tumor increased, in spite of this, rapidly, and soon attained the size of a large goose egg. The son of the patient, a navy surgeon, was called in in consultation, and the cancerous nature of the affection was fully recognized. The first treatment was replaced by injection of the sublimate solution, a series of six every two days. At the end of three weeks all trace of the tumor had disappeared, and no return had taken place up to the present. Curious to say, the son had noticed in his own groin two small ganglions, which had dated three years back. However, about a year ago they became much more enlarged and harder, in spite of every possible treatment. Struck with the result of the injection in his father's case, he tried them on himself, and for that purpose injected four half-syringefuls daily. At the end of a week these glands disappeared. A sixth case was that of a man who said that he had something wrong with his rectum, as he had often remarked a fetid bloody discharge from the anus. Examination revealed the existence of a malignant tumor. Four injections were made daily, and in twenty days the cancer had *vanished!* The seventh and last case was that of a woman, aged 58. She was very emaciated, and presented in the left breast a hardened nodulated tumor about the size of a large walnut. There was no retraction of the nipple nor any affection of the ganglions. Two injections were made, and renewed eight days subsequently. Three months afterward Dr. Poucel revisited the patient, when no trace of the tumor could be found. Four more patients are at present undergoing the treatment, and a notable progress is marked in each of them. In concluding, the author says that he does not pretend that the real treatment of cancer has been found, but what he can affirm is that certain tumors of a *cancerous appearance* are susceptible of being removed by the injections in question, and the chances, as may be conceived, are much greater when practiced at the commencement. He used the words *cancerous appearance* advisedly, as in some subjects tainted with hereditary syphilis tumors resembling cancer are observed. However, in these cases iodide of potassium is the specific, whereas it has no effect on the true cancer. Several of his patients were treated, as stated above, by that drug without result. Therefore, it may be regarded as almost certain that all the cases mentioned were real cancers.

Dangerous to Live.

Are we safe nowhere from bacteria, some one inquires, not even when we are sealed up in a vacuum in a glass case? Not content with showing us that horrid monsters claw and fight in every drop of water we drink, scientific gentlemen have now been microscopically overhauling a hailstone and finding that an infinitesimal speck of the ice contains no less than 400 to 700 bacteria. They may be the germs of smallpox, scarlet fever, leprosy, naughtiness, and crime. Not even ice will kill them, for they thaw out and wriggle ferociously. The invention of the microscope revealed wonders to man, but it has made life a burden to nervous people. Nothing is free from microbes any more, nothing is pure, except the benevolent motive of one, says the same inquirer, who lends a friend five dollars when he never expects to get it back again.

MR. BRUSH'S WINDMILL DYNAMO.

It is difficult to estimate the effect of an invention on existing practices and industries. Occasionally a new invention will appear which will greatly affect a whole range of allied inventions and industries in such a way as to entirely change time-honored customs, inaugurate new practices and establish new arts. The commercial development of electricity is a notable example of this.

After Mr. Brush successfully accomplished practical electric illumination by means of arc lights, incandescent lighting was quickly brought forward and rapidly perfected. Gas lighting was also improved in various ways. Simultaneously with these, the electric distribution of power was carried forward, and important improvements were made in prime movers for driving dynamos. In this direction much has been done both in steam and water motors. Wind power has been repeatedly suggested for driving dynamos, but the adaptation of the windmill to this use seems to have been a problem fraught with difficulties. Few have dared to grapple with it, for the question not only involved the motive power itself and the dynamo, but also the means of transmitting the power of the wheel to the dynamo, and apparatus for regulating, storing and utilizing the current.

With the exception of the gigantic windmill and electric plant shown in our engraving, we do not know of a successful system of electric lighting operated by means of wind power.

The mill here shown, as well as all of the electrical apparatus used in connection with it, and the very complete system by which the results are secured, have been designed and carried out according to the plans of Mr. Charles F. Brush, of Cleveland, Ohio, and under his own personal supervision. As an example of thoroughgoing engineering work it cannot be excelled.

Every contingency is provided for, and the apparatus, from the huge wheel down to the current regulator, is entirely automatic.

The reader must not suppose that electric lighting by means of power supplied in this way is cheap because the wind costs nothing. On the contrary, the cost of the plant is so great as to more than offset the cheapness of the motive power. However, there is a great satisfaction in making use of one of nature's most unruly motive agents.

Passing along Euclid Avenue in the beautiful city of Cleveland, one will notice the magnificent residence of Mr. Brush, behind which and some distance down the park may be seen, mounted high on a tower, the immense wheel which drives the electric plant to which we have referred. The tower is rectangular in form and about 60 feet high. It is mounted on a wrought iron gudgeon 14 inches in diameter and which extends 8 feet into the solid masonry below the ground level. The gudgeon projects 12 feet above the ground and enters boxes in the iron frame of the tower, the weight of the tower, which is 80,000 pounds, being borne by a step resting on the top of the gudgeon. The step is secured to a heavy spider fastened to the lower part of the frame of the tower.

In the upper part of the tower is journaled the main wheel shaft. This shaft is 20 feet long and 6½ inches in diameter. It is provided with self-oiling boxes 26 inches long, and carries the main pulley, which has a diameter of 8 feet and a face of 32 inches. The wheel, which is 56 feet in diameter, is secured to the shaft and is provided with 144 blades, which are twisted like those of screw propellers. The sail surface of the wheel is about 1,800 square feet, the length of the tail which turns the wheel toward the wind is 60 feet, and its width is 20 feet. The mill is made automatic by an auxiliary vane extending from one side, and serving to turn the wheel edgewise to the wind during a heavy gale. The tail may be folded against the tower parallel with the wheel, so as to present the edge of the wheel to the wind when the machinery is not in use. The countershaft arranged below the wheel shaft is 3½ inches in diameter, it carries a pulley 16 inches in diameter, with a face of 32 inches, which receives the main belt from the 8 foot pulley on the wheel shaft. This is a double belt 32 inches wide. The countershaft is provided with two driving pulleys each 6 feet in diameter, with a face of 6½ inches, and the dynamo is furnished on opposite ends of the armature shaft with pulleys which receive belts from the drive wheels on the countershaft.

The dynamo, which is one of Mr. Brush's own design, is mounted on a vertically sliding support and partially counterbalanced by a weighted lever. It will be seen that the countershaft is suspended from the main shaft by the main belt, and the dynamo is partly suspended from the countershaft by the driving belts. In this way the proper tension of the belts is always secured, the total load on the dynamo belts being 1,200 pounds, and on the main belt 4,200 pounds. The ends of the countershaft are journaled in sliding boxes connected by equalizing levers which cause both ends of the shaft to move alike. The pulleys are so proportioned that the dynamo makes fifty revolutions to one of the wheel. The speed of the dynamo at full load is 500 revolutions per minute, and its normal capacity at full load is 12,000 watts.

The automatic switching devices are arranged so that the dynamo goes into effective action at 330 revolutions a minute, and an automatic regulator is provided which does not permit the electromotive force to run above 90 volts at any speed. The working circuit is arranged to automatically close at 75 volts and open at 70 volts. The brushes on the dynamo are rocked automatically as the load changes. The field of the dynamo is slightly compounded. The current passes from the dynamo to contact shoes of polished and hardened steel carried by a cross bar on the tower, which shoes slide on annular plates surrounding the gudgeon. Conductors extend underground from these plates to the dwelling house. To guard against extraordinary wind pressure, the tower is provided at each of its corners with an arm projecting downwardly and outwardly, and carrying a caster wheel very near but not in contact with the circular rail concentric with the gudgeon. Ordinarily, these caster wheels do not touch the rail, but when the wind is very high, they come into contact with the rail and relieve the gudgeon from further strain.

In the basement of Mr. Brush's house there are 408 secondary battery cells arranged in twelve batteries of 34 cells each; these 12 batteries are charged and discharged in parallel; each cell has a capacity of 100 ampere hours. The jars which contain the elements of the battery are of glass, and each cell has its liquid covered with a layer of "mineral seal" oil, a quarter of an inch thick, which entirely prevents evaporation and spraying, and suppresses all odor. The automatic regulating devices are shown in one of the views of our engraving. At 1 are shown the voltmeters and ammeters employed in measuring the charging and discharging currents; at 2 is shown a series of indicators, one for each battery, 3 represents an electrically operated switch by means of which the current may be turned on or off the house mains by pressing push buttons in different portions of the house; 4 represents a ground detector, which is connected with the center of the battery and with the ground, so that should the conductor upon either end of the battery be grounded, the fact will be indicated by the movement of the index in one direction or the other from the zero point of the scale, thus showing not only that the battery is grounded, but indicating the grounded pole; 5 is a leakage detector connected up with the lamp circuits, and arranged to show any leakage from one conductor to the other; at 6 is shown a compound relay for operating the automatic resistance shown at 7. This resistance is placed between the batteries and the house mains, and is arranged to keep the voltage on the lamps constant at all times. In this device the resistance is secured by means of powdered carbon placed under varying pressure, the necessary movement being made by means of hydraulic pressure under the control of the relays.

The house is furnished with 350 incandescent lights, varying from 10 to 50 candle power each. The lamps most commonly used are from 16 to 20 candle power; about 100 incandescent lights are in every day use. In addition to these lights there are two arc lights and three electric motors. It is found after continued use of this electric plant that the amount of attention required to keep it in working condition is practically nothing. It has been in constant operation more than two years, and has proved in every respect a complete success.

The Faithful Dog of Helvellyn.

A monument has just been erected on Helvellyn (a mountain of Cumberland, England, 3,300 feet high) to the memory of Charles Gough, who, in the year 1805, was killed by falling from the high crags on the ridge that joins Striding Edge to the summit; and of the faithful dog who for three months watched over her master's remains. Sir Walter Scott describes the event in the poem "I climbed the dark brow of the mighty Helvellyn," and Wordsworth records it in his lines on "Fidelity."

The young man was returning to Wythburn, where he lodged, from a fishing excursion in Patterdale. The accident was probably caused by a false step, during a blinding hailstorm or a dense fog that day. It happened on April 18, and on July 20 his bones were found, still watched by the starving dog, a little yellow, rough-haired female terrier. She had given birth to puppies, which were found dead by the side of the corpse. It is believed, though unable to secure enough food for milk for her young, she maintained life by bits of carrion sheep which are not unfrequently found on the hills; but she might have had to range far and wide during her three months' watch. The mere fact that the bones were found intact serves to prove the assertion that the dog did not touch the remains of her master, for dogs break the bones to suck the marrow. This animal died a few years afterward at Kendal.

The merit of the suggestion to erect this monument belongs to Miss Frances Power Cobbe, whose design has been carried into execution by the aid of the Rev. H. D. Rawnsley, Vicar of Crosthwaite, both names of some repute in literature.—*Illustrated London News.*

Correspondence.

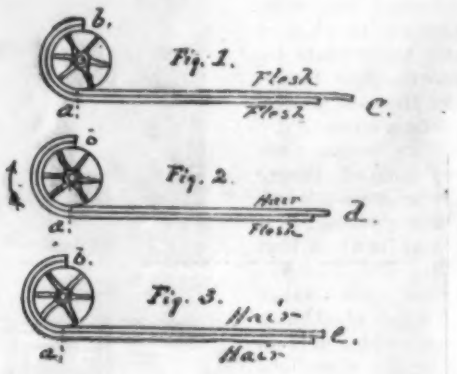
THE BELT PROBLEM.

To the Editor of the Scientific American:

We notice the "belt problem" did not escape attention. It is a little strange, however, that a "head engineer" should miss the mark so widely in attempting to explain the reasons for the *creeping* of a belt.

At first thought, there seems to be little or no importance attaching to this question, but by following it up, facts may be revealed that are of use, both in making and using leather belts. The side of a belt which should be run next the pulley, we think, has not been fully settled, though double belts, we believe, are made with the flesh sides together. So it makes no difference which side of such a belt is used next the pulley, unless it be on account of riveting.

The effect of placing leather together in different positions may be seen by a very simple experiment, as shown in Figs. 1, 2 and 3. Take two strips of leather



of equal length, place the two finished or hair sides together and the ends at *d*, Fig. 1. Hold the other end at *c*, with equal tension, turn the pulley in the direction of arrow, and stop at *b*. If the pulley be 6 in. diameter, the ends at *c* will be found to be 1¼ in. apart. The same experiment is shown at Fig. 2, except that one hair and one flesh side are placed together, with hair side next the pulley. We now find a difference of 1 in. at *d*. The result is the same if the flesh side is next pulley and the hair side out. By placing both flesh sides together, as shown in Fig. 3, we find the slip at *e* to be ¾ in., only one-third as much as at *c*, Fig. 1.

We conclude from this that the flesh side of the leather is the more rigid, whereas this side is usually taken for the soft and flexible side. The test in Fig. 1 shows that the hair side of the under belt has expanded, and the same side of the other belt has contracted as much as was necessary to allow for the difference in diameters between the pulley and the outside of outer belt, the fibers on flesh side retaining their normal condition. In Fig. 2, the hair side next the pulley has contracted, so it has taken more belt to reach around the pulley; hence the difference of ¼ in. between *c* and *d*. In the case of Fig. 3, the hair side on inside has contracted, and that on outside stretched, but not enough to make up the entire difference in diameters of these surfaces. Had they done so, the end at *c* would be even and show no creeping. This shows some flexibility in the flesh surfaces, but not one-third as much as in the hair sides. That on the flesh side, however, is much more evenly distributed than on the hair side, as will be seen by bending the leather first one way and then the other. Under such action the flesh side remains smooth while the other crumples and presents a very uneven surface. This of itself, we think, is a strong reason for working the flesh side of a belt next the pulley; and for a double belt, the form in Fig. 2 would, therefore, be best, with the belt reversed. As long as a belt continues to stretch, its limit of elasticity must evidently be exceeded by the working strain, and with double belts this strain is greatly increased by the stretch or tendency to creep, while passing around the pulleys, and especially when the latter are comparatively small. Were it not for the rough surface presented to the pulleys by the hair side, we would favor the form of double belt shown in Fig. 3, for in this there is less tendency to creep than in any other. It would seem desirable to fasten leather together the way in which it is most natural for it to remain.

We have dealt with this subject more at length than we expected in the beginning, but as leather belts are not likely to be wholly superseded by other means of transmission, some of your many readers may take an interest in the subject. QUIRK.

REMEMBER that the next number closes the volume of the SCIENTIFIC AMERICAN. Present subscribers will oblige the publishers by signifying their intention of continuing the paper by remitting at once. New subscribers solicited.

NEW MARINE SIGNAL.

The instrument shown in the accompanying engraving, and called the lucigraph, is used for signaling at night, and commends itself especially to those engaged in marine pursuits. It is adapted for use by the mercantile marine, by lighthouses, signal, coast guard, telegraph, or other stations, and for the use of lightships.

It is constructed on the principle of the stereopticon or magic lantern, and is worked by keys similar to the typewriter, each key being attached to a metal plate stenciled in any desired character, such as a letter of the alphabet or numeral. Each key is painted with a character similar to that cut out of the plate to which it is attached, and when pressed, it projects the letter plate before the light, throwing the said character on a screen.

For ordinary use an Argand burner kerosene lamp is sufficiently strong, as it is estimated that every five candle power gives a range of vision of about a quarter of a mile on a bright moonlight night. Of course, for higher and better service, the electric or lime light should be used in the lantern.

The signals can be read by any one without instruction, and when code letters, like those of the universal international code, are used, it can be read by any one using the code book carried on all ships. It would be found useful on pilot boats for signaling their numbers as well as for speaking ships. It also signals by any flash code, and by exposing the bull's eye lens and working a special mechanism it can be made to signal quite as fast and to a greater distance than most of the patent flash code lamps in use.

It has been exhaustively tested by practical men in all weathers, and has received much favorable comment. Among those who have commended its use may be mentioned: The head signal department, Washington, Brigadier-General Greely; the signal department, Fort Meyer; Captain Sir Baldwin Walker, H. M. S. Emerald; Captain Watkins, steamship City of New York; Captain Barclay, superintendent Allan Line; Capt. Ritchie, steamship Parisian; and many other practical men. Captain S. M. Orr, of the London steamship Port Donaldson, who has had it several months on his ship, between London and Australia, has sent in a favorable official report.

The apparatus has been patented here and in Europe by the inventor, Mr. John W. Hayward, Astor House, New York City.

The screen should be of white duck or of some bright color. A house may be used or anything giving a flat surface confronting the point to be signaled to, but the most efficient device is probably a diamond shaped duck screen located on the bridge, which may be hoisted or lowered at pleasure, and held in place by stays, as shown in the cut, so that it can be turned at pleasure toward any point of the compass.

NEW MARINE SIGNALING DEVICE CALLED THE LUCIGRAPH.

Twenty Stories High.

The new Masonic building now being erected in Chicago will be an architectural marvel. It is to have a frontage of 170 feet, a depth of 114 feet, and will be twenty stories high, and the roof will be nearly 300 feet from the level of the street. There are to be eighteen elevators, arranged in a semicircle, having a total carrying capacity of 40,000 passengers daily. The entrance is to be 42 feet high by 28 feet wide, and the rotunda, with an area of 3,700 square feet, will be opened to the roof, where visitors will find a pavilion garden from which they can get a bird's eye view of all creation.

A twenty story building has been lately proposed in London, but the idea of it nearly takes the breath away from the people there, and it doubtless will be half a generation before they set to work to erect it.

Necklaces of Human Teeth.

Mr. R. H. Woodhouse presented to the Odontological Society, London, at its last meeting, a necklace of human teeth, for which he was indebted to the kindness of Mr. H. M. Stanley. The necklace was found upon a young warrior, a native of Avisibba, a cannibal tribe, upon the Sturi River, who was killed in an attack upon Mr. Stanley's party, in which Lieut. Stairs was wounded with a poisoned arrow, at the junction of the Ruku and Sturi Rivers, 1,500 miles from the mouth of the Congo. These necklaces are considered horrible by non-man-eating tribes. Other tribes wear necklaces of monkey or crocodile teeth. This particular necklace consists of thirty-eight teeth, some of which are deciduous, and one molar was observed to be carious. Most of the single-fanged teeth were perfect, but the roots of the molars were more or less broken by the rude method of removal, in order to facilitate which the natives burn the skulls to a certain extent. Mr. Stanley informed Mr. Woodhouse that many of these necklaces consisted of several rows, and sometimes contained as many as 400 teeth; and, further, speaking of the prevalence of caries among the natives of Africa, which appears to be far greater than is generally supposed, stated that during the Emin Pasha expedition he and his subordinates extracted between 300 and 400 teeth for their followers; these, however, were natives of the extreme west and extreme east, and not of central Africa.—*Lancet.*

A PINE APPLE GROVE IN FLORIDA.

The pine apple (*Ananassa sativa*) belongs to the Bromeliad family, and is indigenous to tropical America, where it was found after the discovery of this country. It was found wild in Mexico and Central America, Guiana and Brazil. It is such a delicious fruit that it is grown now in various parts of the South. Our engraving was prepared from a photograph taken by Mr. Wm. H. Jackson, of Denver, and represents very well the manner in which the fruit grows. This pine apple field is located at Eden, on the Indian River, Florida.

A PINE APPLE GROVE IN FLORIDA.

To tell the truth of electricity, about which we are wont to speak glibly enough, and which we introduce into our equations quite as a matter of course, we know, directly, absolutely nothing whatever. Concerning electrical energy we know much; but the factor of it which we call electricity eludes alike our senses and intelligence. From a practical point of view, electricity is hardly more than a mathematical coefficient, of which we may in due season learn the physical significance.—*Electrical World.*

TO THE NORTH POLE IN A BALLOON.

The north pole, despite the long, ominous list of martyrs to scientific or commercial curiosity, continues to exert a fascination over many minds. This fascination Jules Verne has graphically depicted in his "Adventures of Captain Hatteras." The problem at present discussed is whether there is land, ice, or an open polar sea at the pole. An attempt is soon to be made to solve the problem by a Parisian aeronaut and a Parisian astronomer, Messrs. Besancon and Hermite, neither of whom has attained the age of thirty. The plan they propose to adopt, while original with them, is by no means new. In 1870 Silbermann, and in 1874 Sivel, published studies dealing with the practicability of reaching the north pole by balloon. In complete ignorance of these researches, Messrs. Hermite and Besancon conceived the same idea. In honor of these researches, which they later discovered, and as a tribute to the memory of an illustrious martyr to aeronautic science, they decided to call their balloon by the name of "Sivel."

The "Sivel," when inflated, will measure 16,250 yards, and have a diameter of 32½ yards. It will be capable of carrying 17½ tons, and will have an ascensional force of three pounds to the cubic yard. The envelope will be composed of two thicknesses of Chinese silk, covered with a new specially devised var-

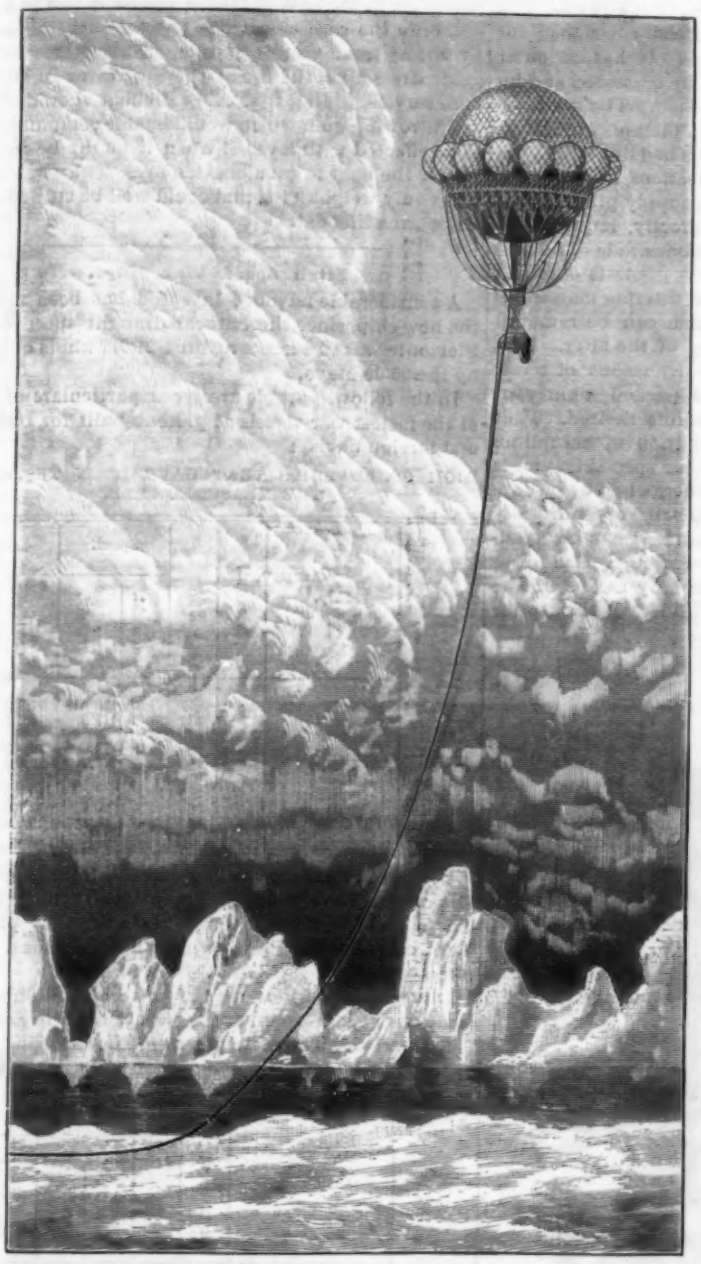


Fig. 1.—THE BALLOON UPON ITS JOURNEY.

Fig. 3.—EXTERIOR OF THE CAR.

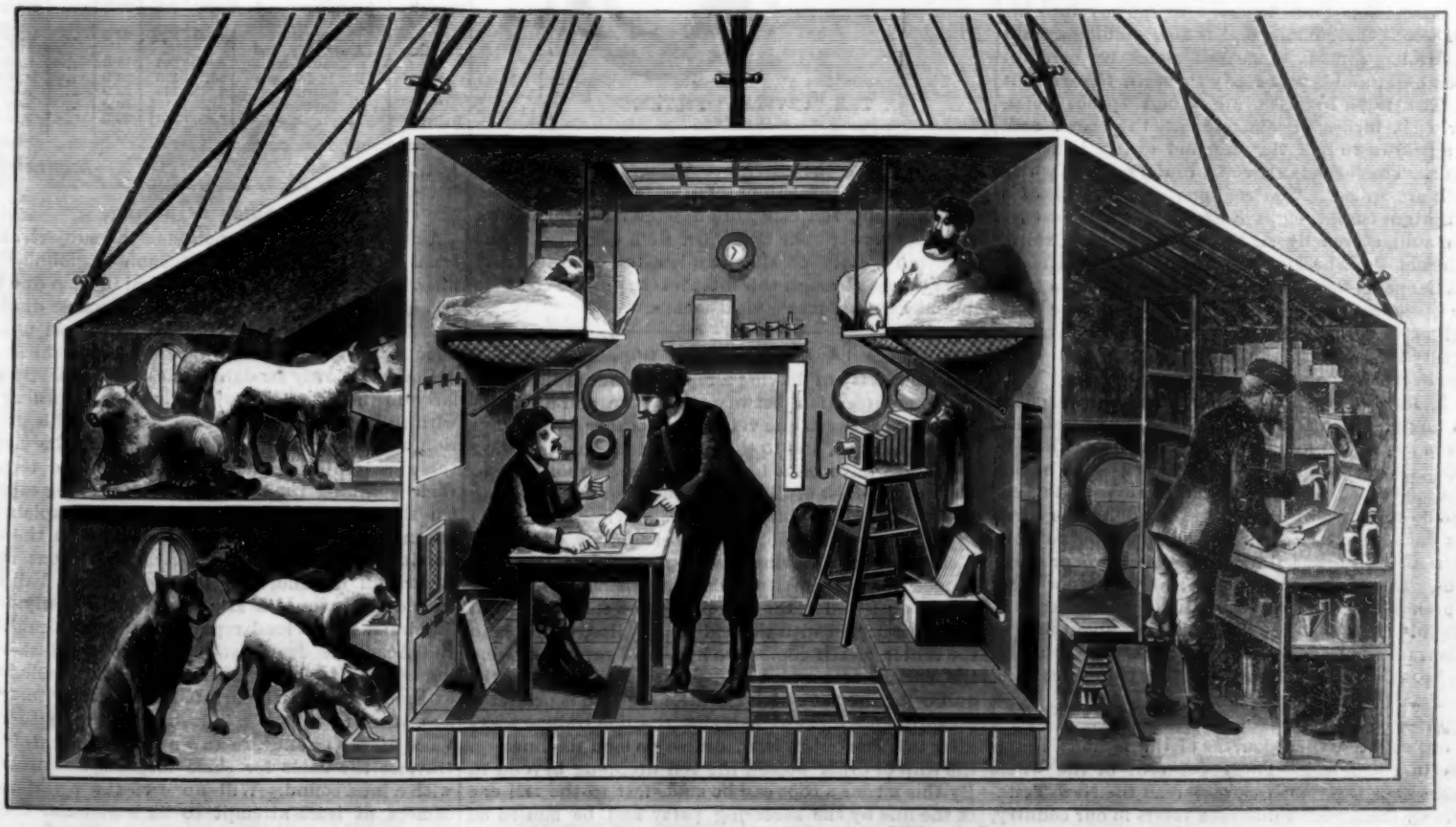


Fig. 2.—VIEW OF THE INTERIOR OF THE CAR.

nish, which renders it absolutely impermeable, and augments the resistance of the envelope, rendering it capable of supporting, without rupture, a pressure of 6,400 pounds to the square yard.

The balloon, which is spherical in shape, will contain an immense internal balloon so constructed as to be perfectly and permanently inflated by 3,250 cubic yards of gas under the same pressure. This is intended to remedy, in great part, the grave inconveniences—the chief cause of balloon instability—which result from hygrometric and thermometric variations produced by altitude changes. The interior balloon is furnished with two valves of automatic certainty which will be in communication with a ventilator moved by electric action. If the gas becomes thinner, the interior balloon can be depleted. If it becomes thicker, the interior balloon can be inflated. The "Sivel" is thus always inflated. The internal balloon represents about one-fifth of the entire balloon, a needed proportion, since balloons raised 2,700 feet lose about one-tenth of their gas, independently of the loss occasioned by temperature variation. The "Sivel" will carry several pilot balloons to be used in studying aerial currents, and sixteen balloonets to supply, through its valves, the gas of the interior balloon of the "Sivel." The balloon's altitude will be regulated by means of a trail rope of considerable weight, which trails as a species of anchor over the ice.

Fig. 1 represents the "Sivel" with its circlet of supply balloonets and its mobile anchor trailing over the ice.

The car, which is of osiers, is so strengthened by steel armatures as to be absolutely rigid. It is so arranged as to maintain in its interior a regular temperature. A safety petroleum heater is used for the purpose. The car will be prepared for all emergencies by making it unsubmersible and furnishing it with runners for use as a sledge. It is ten feet wide by sixteen long, and will contain, besides the two explorers and their three aids, eight Esquimaux dogs, a sledge, an unsubmersible canoe, provisions and water rendered unfreezable by a chemical procedure. The total weight of car and contents is fifteen tons. Above the car is a bridge accessible by a rope ladder.

Fig. 2 represents a section of the car with its contents.

The explorers will sail from France in two steamships in the latter part of May, 1892, so as to arrive in Spitzbergen in July. There they will depart as soon as practicable by favorable winds from the south. The exploration will last in all six months. Its cost will be $108,000, of which $12,000 is required for the construction of the "Sivel." The cost is defrayed by Mr. Hermite and some English capitalists of scientific aspirations. While the idea of reaching the north pole by balloon is not a new one, it has had its details on this occasion for the first time worked out with great care. *L'Illustration.*

A Novel Logging Road.

Mr. Angus McPherson, of Cumberland County, Nova Scotia, has built 1¼ miles of railway into his lumber woods this summer and is now running a train on it. He has already taken out about 100 cords of hemlock bark, and is now ready to begin to carry out logs. The rails he used are round spruce poles, properly six inches in diameter at the larger end, tapering down to half the size, and neatly joined at the ends. The sleepers are small round poles on which the rails are spiked. The rolling stock consists of a small upright engine, eight horse power, and two flat cars, manufactured by A. McPherson & Co., Oxford. The tires of the wheels on engine and cars are made with a flange on both sides to prevent them from leaving or spreading the rails, and the wheels have play enough on the axles to accommodate themselves to any inequality in the width of the rails caused by the difference in size of the poles used.

Mr. McPherson has gone to no unnecessary expense in grading his track. He has followed round the hills, and says he has comparatively level track. The engine is placed between the two cars he uses, so he has no trouble in making up his train. He expects this engine to do the work of eight horses, and he can carry on his work all winter even if there should be no more snow than there was during the last two or three seasons. It was the scarcity of snow in late winters that prompted Mr. McPherson to adopt this means of getting his logs out to the river. It cost about $300 to lay his track, and the engine cost $400. What has already been done shows clearly that the plan is feasible. —*The Timberman.*

IN our country, three-fourths of the nation's illiteracy is in the South. Forty per cent of the whole population of the South cannot read the New Testament. Of the 2,000,000 illiterate voters in our country, 1,500,000 are in the South. The negro population, now about 8,000,000, increases at the rate of 500 per day.

Among the more than 2,000,000 mountain whites in the South, one-half cannot read. Of the 50,000 Indian children, less than 15,000 are in school. The Chinese in America are few, but they represent one-third of the population of the globe.

THE "CRYSTAL" WATER FILTER.

The accompanying cut represents the "Crystal" water filter now being made and sold by the Crystal Filter Co., of Buffalo, N. Y., and which was patented in 1887 by Mr. William Franklin, of New Haven, Conn. It is a pressure filter and can be made of any size. The cut represents Crystal No. 2, especially designed for household, office, and general use. It has an outer case 8 inches long and 3⅛ inches in diameter, and inner cylinder of seamless brass tubing. The whole is heavily nickeled, and when put up presents an attractive appearance. The filter is attached directly to the supply pipe by the ordinary connections, and a lower large faucet is connected with the supply pipe, so that unfiltered water can be drawn directly, requiring no extra pipes. From another faucet one grade of filtered water can be drawn, and the finest grade is obtained from the faucet at the top. The filtering material is contained in an inner cylinder which can be removed at pleasure by unscrewing the top of the filter. This filtering material is held in place by means of screw clamps, thus permitting it to be packed tightly or loosely, or with any filtering medium desired. That used by this company is a combination of corundum invented by Mr. Franklin. Another special feature is the reversibility of this filter cylinder, whereby on supplying the full pressure all foreign matter is effectually expelled. Perhaps its greatest merit lies in being automatically self-cleansing while working. The lower large faucet is then kept open, and by means of fine disks just below the filtering cylinder all the grosser

THE "CRYSTAL" FILTER.

impurities, which would otherwise be pushed in and remain to defile the filter, are immediately separated and washed off through this faucet. Its convenience, durability and simplicity are designed to win for it a high degree of public favor. Dr. Fell, president of the American Society of Microscopists, has reported that water passed through this filter was as pure as could be obtained by any mechanical means.

A Line-throwing Gun.

The necessity of having a reliable method of effecting communication between the shore and a ship in distress or between one vessel and another has always been recognized, and to this end various line-throwing appliances have been brought forward from time to time. The latest of these is the shoulder line-throwing gun invented by Captain J. D'Arcy-Irvine, R.N. This apparatus, which is not an expensive affair, consists of a shoulder gun having the cop, or coil of line, suspended in a case carried under the breech of the gun. A rod is inserted in the barrel, the fore end of the rod being connected with the end of the line, which is in the center of the cop. The line is 144 yards long, and the charge of powder used is 2 drachms. Upon the gun being fired at a high elevation, the rod is projected upward and forward, carrying the line trailing away after it. The object is, of course, to land the line over the ship or other object, the rod dropping beyond it. By this means a rope can be made fast to the tail end of the line by the succoring party and be hauled on board by those in distress. A demonstration with this system recently took place near London. There were present Admiral Sir John Corbett, of the National Lifeboat Institution; Captain Chetwynd, chief inspector of lifeboats; Colonel Clayton, and others. Several shots were fired by Captain D'Arcy-Irvine, which successfully demonstrated the value of his system so far as it could be demonstrated on land and apart from the conditions under which such apparatus is required to be used. Good ranges were obtained, and the line was carried well over the intended object. Captain D'Arcy-Irvine drew attention to the desirability of the invention in the case of taking vessels in tow in a high sea, or in the case of arresting vessels drifting ashore by firing from vessels at anchor. He likewise lays great stress upon the use of the apparatus in the lifeboat service, urging that every lifeboat should carry a line-throwing gun, which would enable communication to be effected with a vessel when it might be impossible for the boat to get alongside her. The whole apparatus only weighs 9 lb., and could well be stowed away on board a lifeboat.

High Speed War Ships.

A considerable advance in speed has been made in the new ship, since the natural draught speed of the Piemonte was 20·4 knots against 21·237 knots obtained by the 25 de Mayo.

In the following table are given particulars of some of the fastest war vessels at present built for our own and foreign navies:

HIGH SPEED SHIPS THAT HAVE BEEN TESTED ON THE MEASURED MILE.

	Ship.	Displacement.	Length.	Speed. Forced draught.	Speed. Natural draught.	I. H. P. Forced draught.	I. H. P. Natural draught.
Spanish ..	Reina Regenta	4,800	317	20·6	18·68	11,500	
French. ..	Surcouf	1,850	312	20·51	17·3	16,287	3,508
"	Forbin	1,850	312	20·64			
English ..	Medusa	2,800	295	19·9	18·005	10,000	6,300
French. ..	Cecille	5,670	360	19·490	..	10,060	
United States..	Baltimore	4,400	315	19·5	..	10,750	
Italian....	Piemonte	2,500	300	22·8	20·4	12,700	7,000
Argentine	25 de Mayo	3,300	325	22·43	21·237	13,800	8,700

Besides these there are a number of passenger vessels which have realized exceptionally high speed. These include the Teutonic, Majestic, City of New York, and City of Paris, which have attained maximum ocean going speeds of about 21 knots.

It will be also interesting in this connection to note some of the high speed cruisers at present in course of construction. These are given in the following table:

HIGH SPEED SHIPS NOW BEING BUILT.

	Ship.	Displacement.	Length.	Speed. Forced draught.	Speed. Natural draught.	I. H. P. Forced draught.	I. H. P. Natural draught.
British....	Blake and Blenheim	9,000	375	22·0	20·0	20,000	
"	Vulcan	6,620	350	20·0	..	12,000	
"	Edgar class	7,320	360	20·0	..	12,000	
Spanish ..	Almirante Quendo	7,000	365	20·0	..	15,000	
"	Alfonso XIII. and Lepanto	5,000	318½	20·0	..	11,000	
French....	Alger, Isly, and Jean-Bart	4,100	346	19·0	..	8,000	
"	Dupuy de Lome	6,297	376	20·0	..	14,000	
"	Charner	4,745	348	20·0	..	8,300	
"	Davoust	3,027	297½	20·0	..	9,000	
Italian..	Liguria class	2,280	262½	20·0	..	6,500	

—*Engineering.*

Globular Lightning.

Among the disputed points in the subject of electrical discharges is the phenomenon of globular lightning. Many treat this as an optical illusion due to the excessively minute duration of the spark discharge, just as, when we have for an instant gazed upon the noonday sun and turned away, we see a reddish globe of fire float slowly straight before our eyes. So singularly do the descriptions of globular lightning tally with this well-known phenomenon, that this explanation would be irresistible were it not for the fact that these portentous spheres are alleged to terminate their alarming promenades by a deafening explosion. On the other hand, it is impossible to explain away the many records of persons who have seen the slowly moving globes of fire. Among these persons was the electrician Cavallo, who saw a luminous ball slowly ascend the stem of a Leyden jar, then slowly descend and burst with a loud report. At a recent meeting of the Academie des Sciences, at the conclusion of a paper on this topic by M. Faye, the meteorologist, the ex-Emperor of Brazil narrated how, nearly forty years ago, when traveling on horseback in the southern province of Rio Grande, he saw a globe of lightning fall, traverse the fields for some instants, and then burst with a loud sound. Will none of the votaries of the camera at least attempt to fix a globular discharge while it is perambulating across the landscape?—*The Electrician.*

A COMPANY has been formed at Chicago, with a capital of ten million dollars, for the manufacture and use of aluminum. It is called the International Aluminum Company.

RECENTLY PATENTED INVENTIONS.

Railway Appliances.

CAR MOUNTING. — Horace Resley, Cumberland, Md. This invention provides for a thrust connection interposed between the side edges of the car and the sides of the truck whereby the motion which takes place between the two in rounding curves is made to adjust the trucks automatically to the curve, so that their axles shall be positively adjusted to a radial position instead of being allowed to adjust themselves.

RAILROAD GATE. — William Zeller, Moorhead, Minn. Lateral lugs, adapted to be depressed by a passing train, are pivoted to sections of the rails, with connections therefrom to a gate-operating mechanism, which is thus adapted to be automatically operated by passing trains so that the roadway will be open when no train is passing and closed by the gate as the train is passing.

CAR COUPLER TOOL.—Jasper B. Lewis, Alexander, N. Y. This is a coupling rod with forked end, the forks being turned at a right angle at the end, while at the other end is a spring hook by which to suspend the tool from the person, whereby the brakeman may stand at the side of the cars and conveniently operate the link and pin, the device being designed to prevent the maiming and loss of life which occurs to so large an extent from brakemen going between cars to couple them. The device has received the indorsement of the New York Board of Railway Commissioners.

TRACK WALKER'S TOOL. — Gabriel Rohrbach and James Shaughnessy, Del Rio, Texas. This is a combination sectional tool which may be conveniently carried, including a claw bar, a spiking maul, a gauge and a level, whereby a single track walker may work effectively alone in doing many things for which a section gang now has to be called.

Electrical.

AUTOMATIC SIGNAL.—Robert O. Owen, Lynchburg, Va. This is a telegraphic railway signal in which the passage of each train past each station or section of track will automatically send a signal to the train dispatcher's office recording the fact, the invention covering a novel construction and arrangement of circuits, contacts and signaling devices.

GALVANIC BATTERY.—Candido G. De Peralta, Havana, Cuba. Combined with zinc and carbon electrodes separated by blocks of insulating material and bound together is a metallic containing vessel, and a paste containing an active and a deliquescent material surrounding the electrodes, forming a compact paste battery of inexpensive material and convenient form, suitable for telephonic, telegraphic and other uses.

HIGH WATER ALARM. — Isaiah H. Simpson, Brunswick, Me. This device consists of a spring-supported bucket with apertured bottom and siphon, the downward movement of the bucket being arranged to operate an electric circuit closer, the alarm being designed especially for use with water towers and tanks in freezing weather, to give instant notice at the engine room in case of high water.

Agricultural.

HARROW AND CUTTER. — Thomas L. Flanagan, Vicksburg, Miss. This is a combination implement, capable also of use as a rake or cultivator, the main frame having an inner frame which can be raised and lowered, there being journaled in the latter frame shafts carrying sickle-like teeth with convexed and concaved edges, providing a durable machine which can be readily manipulated.

Miscellaneous.

CLOTHES LINE SUPPORT. — Henry Clayton, Hoboken, N. J., and Lewis Bried, Union Hill, N. J. This is a safety device consisting of a bracket plate adapted to be attached to a window jamb, with other novel features, for the support of the inner bight of an endless clothes line, whereby the placing of the washed goods on the line is made easy and safe, it being effected within the apartment through the window of which the line is extended.

CLOTHES DRIER. — William Holt, Milwaukee, Wis. This invention consists of a bracket on which is pivoted an adjustably held arm, while a cross bar supporting drying rods is fastened on the pivoted arm, forming a simple device which can be readily applied to a wall and conveniently folded up when not in use.

GAS STOVE BURNER — Warren L. Cort, Brooklyn, N. Y. This burner is formed of two plates screwed or bolted together, and having upwardly extending and inwardly inclined waved edges, whereby a large amount of flame area is obtained in a given circle, to secure a high heat and the most complete combustion, without clogging or smoking, the device being simple and inexpensive.

WASHING MACHINE. — David D. Weisell, Fort Wayne, Ind. This invention provides a machine in which a tub or other receptacle has a concaved false bottom, in which is revolved a self-adjusting conical rubber above the concave bottom, with gearing for operating the rubber, the machine performing all the operations of washing by hand, such as rubbing, pressing and rinsing.

SUSPENDERS.—Jacob Katzenburg, New York City. These suspenders have laterally curved shoulder straps each formed of a single piece, with back plates attached to the backs of the straps at their converging points, with cross lacings and covers, forming an inexpensive support for the trousers that will conform to the movements of the body of the wearer and fit easily.

VEHICLE WHEEL.—Henry Q. Maurino, Albuquerque, New Mexico. The hub of this wheel is mainly metallic, and the hub box is engaged by a concentric sleeve whereon two loose hub sections are mounted, a radially undulating endless band being located between the hub sections and supported on spaced radial saddle frames, whereby the spokes are securely retained in the hub and adapted to be radially projected to tighten the wheel rim in the tire.

SYSTEM OF ROAD DRAINAGE.—Alexander Mitchell, Waldrip, Texas. The drain is arranged longitudinally under the roadbed, with outlet pipes at suitable distances, each adapted to be closed at its outer end, while branch pipes extend from the drain adapted to be connected with an air pump for pumping the air out of the drain, in order to quickly dry the roadbed after a heavy rainfall.

PAPER HOLDER AND CUTTER. — George M. D. Manahan, New York City. This is a device mainly designed for holding and cutting heavy rolls of wrapping paper, received with a close wrapper around them, the roll being supported to turn around a vertical axis while an upright cutter is arranged to cut or tear off the paper in desired lengths as it is unreeled from the roll.

GLAZIER'S DIAMOND.—John E. Lloyd, Brooklyn, N. Y. This invention provides an attachment readily applied to the ordinary diamond, whereby it may be conveniently used by an inexperienced person, the handle and block of the tool automatically assuming the proper angle for successful work the moment the diamond is placed on the glass and pressure is exerted.

STOPPING SEAMS IN DRILL HOLES.—Matthias Garvey, Hammondville, N. Y. This invention covers a method of stopping veins leading to drill holes by depositing a cartridge of paraffine in the hole and then applying pressure to the top of the cartridge to compress it and force the paraffine into the vein, the cartridge being of such size as to extend above the vein.

AIR GUN. — Stephen D. Engle, Hazleton, Pa. This invention covers an improvement in air guns in which the air by which the projectile is expelled is compressed by a spring-actuated plunger, the invention embracing novel features of construction in a gun of few parts, not liable to get out of order, easily operated, and by which a missile is expelled at high speed and with great precision.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

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DECEMBER NUMBER.—(No. 62.)

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1. Plate in colors, illustrating a handsome residence at Plainfield, N. J., erected at a cost of $20,000. Perspective elevation, floor plans, sheet of details, etc. Messrs. Rossiter & Wright, New York, architects.
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3. The Hackley Public Library Building at Muskegon, Mich.
4. An attractive and economical church for a country village. Cost $5,000, perspective view and ground plan.
5. A cottage at West Brooklyn, N. Y. Floor plans and photographic view. Estimated cost $2,500.
6. Country house at Wayne, Pa. Cost complete $9,000. Perspective elevation and two floor plans.
7. An attractive cottage in Buena Park, Chicago. Estimated cost $4,500. Photographic view and two floor plans.
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11. Attractive country house at Narberth Park, Pa. Cost complete $18,000. Two photographic views and floor plans.
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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and though we endeavor to reply to all, either by letter or in this department, each must take his turn.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(2655) E. P. H. asks (1) how to burnish photographs. A. Use a burnishing machine sold by dealers in photo. materials. 2. How hot do you heat the burnisher? A. Heat the iron until the finger previously dipped in water sizzles when in contact—about the same as flat irons are treated. 3. What is used for a inbricator? A. John R. Clemons, an authority, recommends in Wilson's *Photographics* the following lubricator:

A.

Paraffine	8 drs.
Benzine	10 oz.

B.

In a mortar grind	
Gum ammoniacum	30 grs.

and add alcohol sufficient to keep the gum from sticking to the pestle. Add A and B together, shake well, and apply with a flannel rag or sponge. 4. Will you recommend some book (suitable for the amateur photographer) that is up to the very latest development of the art? A. The "Amateur Photographer," by Ellerslie Wallace.

(2656) J. M G. asks (1) how to mix one gallon of paint that will be fireproof. A. There is no fireproof paint. Probably as good an approach as any would be oxide of iron (metallic) paint. Some books give a whitewash under this title. 2. A receipt to stop hair from falling out of the head, in which there is no dandruff. A. See our SUPPLEMENT, Nos. 388 and 396. 3. How to cure chapped hands? A. Try camphor ice, rubbed on at night, with gloves worn over it. 4. How to kill fleas on a collie dog (long hair). A. Try Persian powder or buhach. 5. A good book on bookkeeping. A. We recommend Bryant & Stratton's "New Counting House Bookkeeping," price $2.50, which we can supply by mail.

(2657) J. F.—The metallic-looking spots on the samples of silver paper sent we think are due to an unfiltered bath, as there is a scum which settles thereon, no matter how long it may be sunned. Filter through cotton just before using, and sprinkle the floor before hanging up to dry. Sometimes particles of pyrogallol or iron dust in the air cause the spots.

(2658) B. S. H. asks: 1. Is there as much strength in a hollow cast iron column of any thickness of shell as there is in a solid one? A. There is greater strength in a hollow column of proper proportions than in a solid column of equal weight. 2. Is there as much strength in a pulley with straight arms as one with crooked? A. The straight-armed pulley of the same weight is stronger than with curved arms. The curve is put in pulley arms to prevent shrinkage cracking.

(2659) W. H. H. says: I have been told that oak fence posts should be cut during the summer or while the sap is up to insure their lasting. Are there any reliable data on the subject? A. Trees of any kind should be cut in the fall or winter in middle and northern latitudes, or at the fall of the leaf, for natural preservation.

TO INVENTORS.

An experience of forty years, and the preparation of more than one hundred thousand applications for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequaled facilities for procuring patents everywhere. A synopsis of the patent laws of the United States and all foreign countries may be had on application, and persons contemplating the securing of patents, either at home or abroad, are invited to write to this office for prices, which are low, in accordance with the times and our extensive facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN, 361 Broadway, New York.

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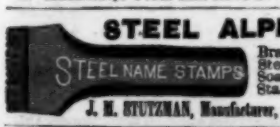

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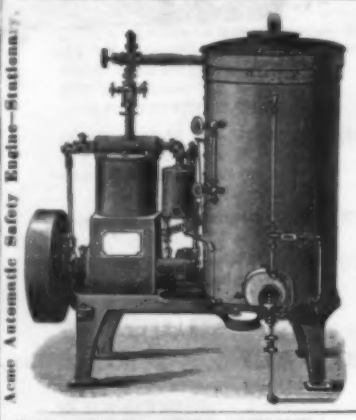

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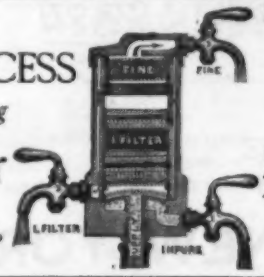

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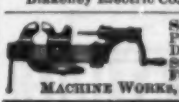

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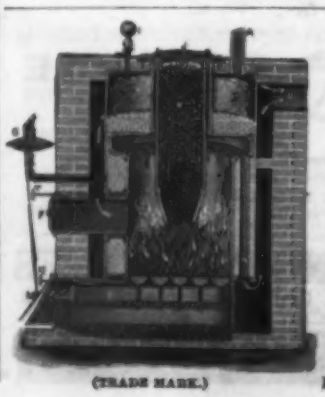

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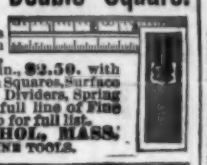

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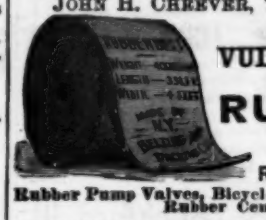

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U. S. Engineer Office, 34 West Congress Street, Detroit, Mich. November 28, 1890.—Sealed proposals, in triplicate, for furnishing all materials and labor and building the masonry of a lock at St. Mary's Falls Canal, Michigan, will be received at this office until 2 o'clock, p. m., January 27, 1891, and then publicly opened. Preference will be given to materials of domestic production or manufacture, conditions of quality and price (import duties included) being equal. Attention is invited to Acts of Congress approved February 26, 1885, and February 23, 1887, vol. 23, page 332, and vol. 24, page 414, statutes at large. The government reserves the right to reject any or all proposals; also to award the contract upon other considerations than the price. For further information apply at this office, or to the U. S. Engineer Office, Sault Ste. Marie, Mich.

O. M. POE, *Col. Corps of Engineers, Bvt. Brig.-Gen., U.S.A.*

Proposals for Constructing Steam Snagboat. U. S. ENGINEER OFFICE, Savannah, Ga., December 1, 1890.—Sealed proposals, in triplicate, for building Steam Snagboat and for furnishing material and machinery for same, will be received at this office until 12 o'clock M (city time) on the 30th day of December, 1890. The attention of bidders is invited to the Acts of Congress approved February 26, 1885, and February 23, 1887, vol. 23, page 332, and vol. 24, page 414, Statutes at Large. For all necessary information apply to

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2. Forms of tender and schedule of conditions and a sketch of the portion of the City showing the streets to be lighted may, on payment of Five Dollars, be obtained from CHARLES HALLETT CLARK, Washington Buildings, No. 1 Broadway, Rooms 209 and 210, New York, who will on application give any further information that may be required.

3. Tenders must be accompanied by a deposit of Rupees, One thousand in cash (not to bear interest) or in Public Securities for that amount to be paid to the Chief Accountant of the Municipality of Bombay, which will be forfeited to the Corporation in case of refusal to sign the Contract embodying the conditions mentioned in the Schedule above referred to.

4. A further payment to make the total deposit equivalent to 5 per cent. on the contract amount will have to be made by the Tenderer whose tender may be accepted, before signing the contract.

5. The Municipal Commissioner does not bind himself to accept the lowest or any tender.

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BOMBAY, India 13th October, 1890.

Dredging at Wilson's Point, Conn. ENGINEER OFFICE, U. S. ARMY, Room B, 7 Army Building, 39 Whitehall Street, New York, N. Y., December 16, 1890.—Sealed proposals, in triplicate, for dredging at Wilson's Point, Conn., will be received at this office until [illegible] (12) o'clock noon on Thursday, January 15, 1891. The attention of bidders is invited to the Acts of Congress approved February 26, 1885, and February 23, 1887, vol. 23, page 332, and vol. 24, page 414, Statutes at Large. Further information can be obtained at this office. Applications should be indorsed on the envelope "Official Business." D. C. HOUSTON, *Colonel of Engineers.*

U. S. Engineer Office, St. Augustine, Fla. November 25, 1890.—Notice is hereby given that on the 27th day of December, 1890, at 12 o'clock, noon, standard time, I will sell at Mayport, Fla., for cash, to the highest bidder, the wreckage from the bark "Neva," consisting of about 35 cords (more or less) of logwood. The logwood is apparently in good condition. It is in sticks from 4 to 8½ feet long, and from 3 inches to 20 inches in diameter. The wood must be removed within 30 days from sale, and until removed will be at owner's risk. For further information apply to this office.

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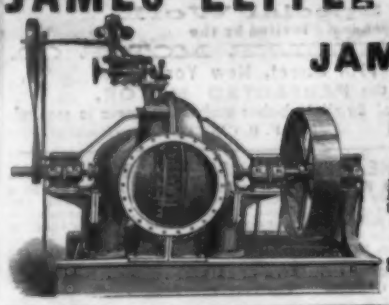

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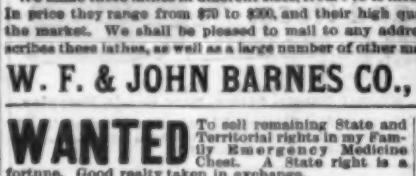

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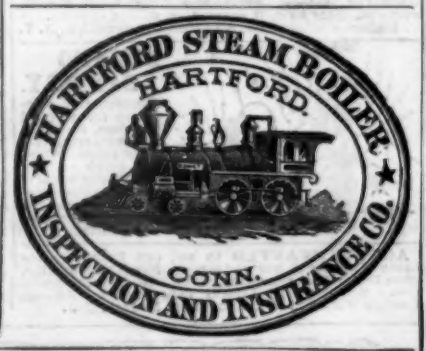

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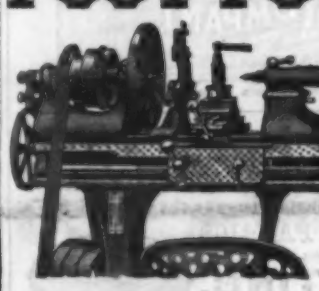

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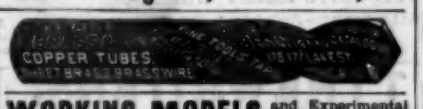

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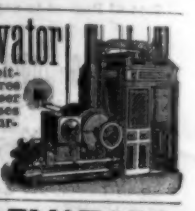

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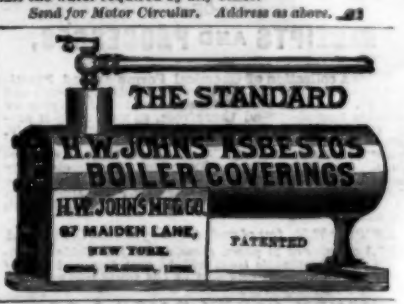

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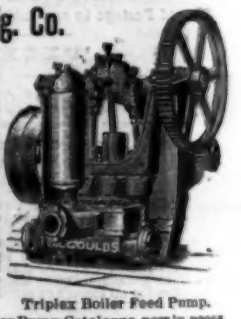

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